Personal Computer World

GET ON THE PHONE TO YOUR MICRO

Canada $2.75/US $2.50/FF 18.50/FL 8.15/SFr 8.00/IR£1.30/BFr 99.00/
Lire 4,700/DKr 24.00 NKr 14.55/DM 9.5.

November 1983 85p

BRITAIN'S BIGGEST MICROCOMPUTER MAGAZINE

COLOUR CLASH!

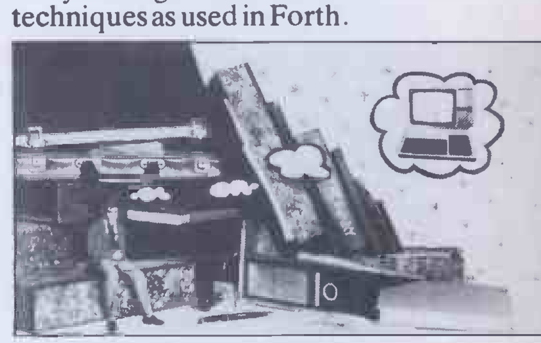
Aquarius vs Tandy MC-10, both under £100

CONTENTS

Vol 6 No 11 November 1983

Cover illustration by Ian McKinnell

FEATURES



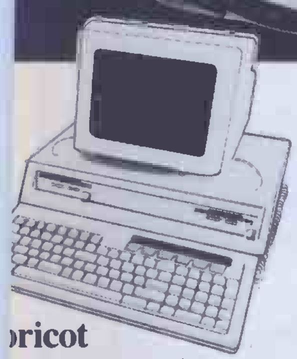
BENCHTESTS & REVIEWS

Founder Angelo Zgorelec **Editor** Jane Bird **Features Editor** Jerry Sanders **Production Editor** Ginny Conran **Programs Editor** Surya **Supplements Editor** Margaret Spooner **Home Computing Editor** Tony Hetherington **Business Computing Editor** Peter Bright **Consultant Editors** Peter Rodwell, David Tebbutt, Dick Pountain **Features Contributor** Maggie Burton **Editorial Secretary** Tracy Dear **Art Editor** Phoebe Creswell Evans **Design Assistant** Paul Ballard **Typesetters** Meadway Graphics 198 Victoria Road Romford Essex **Publisher** John Cade **Group Advertisement Manager** Mike Carroll **Advertisement Manager** Peter Goldstein **Assistant Advertisement Manager** Matthew Parrott **Sales Executives** Phil Pratt, Gaye Collins, Joe Harrower, Marion O'Neill, Caroline Shepherd, Nicky Start, Robert Stallibrass **Advertisement Assistant** Tracey Collins **Group Production Manager** Laura Cade **Advertisement Production** Tony Keefe **Production Assistant** Jeska Harrington

REGULARS

STOP PRESS . . .
The winners of the catalogue competitions at the *PCW* Show:
An Apricot goes to: Jon K Semple, 4th floor, Seal House, Swan Lane, London EC4R 3TH.
A Spectrum goes to: Mrs Jean Butcher, 23 Gibson Ct, Ditton Rd, Langley, Slough, Berks SL3 8PP.

Subscription Enquiries Stuart Cruickshank **Subscription Rates** UK: £12.50. Overseas £27.50 **Subscription and mail order address** 53 Frith Street, London W1A 2HG. tel: 01-439 4242 telex 23918 VNUG **Editorial and advertising address** 62 Oxford Street, London W1A 2HG, tel: 01-636 6890. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9, tel: 01-733 4444.



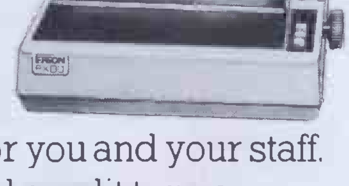
pricot

orders taken now for Apricot, l receive a free introductory tware program!

SPECIAL OFFER!

EPSON RX-80 ft, 100 characters per second, dot addressable graphics, condensed and double width printing. Fx-80 160 characters per second, proportional spacing, quick forms tear off, and many other features.

SPECIAL OFFER!



* User training for you and your staff.
* Easily arranged credit terms.
* Sophisticated technical and service back up.

TAKE ADVANTAGE OF OUR

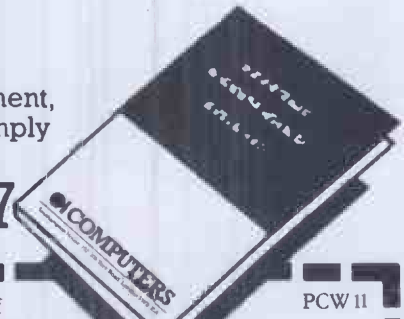
COMPUTER CLINIC

Hot line EXT. 66

Any performance or technical question answered without obligation.

Call us for an appointment, sales/mail order, or simply drop in!

01-228 2207



PCW 11

Please send me a copy of your introductory brochure and details of the Act Sirius I.

Name ____________________

Address ____________________

____________________ Tel No: __________

Occupation ____________________

Southampton House, 192-206 York Road, London SW11 3SA

BBC Microcomputer System

OFFICIAL BBC COMPUTER DEALER

MODEL A AVAILABLE
£299 Inc. VAT

This is the best microcomputer currently on the market, 32K RAM, 32K ROM, 8 modes of operation, full colour, full-size keyboard, internal expansions such as disc interface, speech synthesizer, Econet interface. – In short, it is a personal computer capable of expanding into a small business system.

BBC Microcomputer Model B	£348	+ VAT –	£399.00
BBC Mod B · disk interface	£409	+ VAT –	£469.00
BBC Mod B · Econet interface	£389	+ VAT –	£447.35
BBC Mod B · disk and Econet interfaces	£450	+ VAT –	£517.50
BBC 100k disk drive	£230	+ VAT –	£264.00
BBC dual 800K disk drive	£699	+ VAT –	£803.85
Torch Z80 disk pack including Z80 2nd processor, 64K RAM and CPN operating system	£699	+ VAT –	£803.85
BBC Teletext receiver (Aug)	£196	+ VAT –	£225.40
BBC cassette recorder and lead	£26	+ VAT –	£29.90
Disk interface kit (free fitting)	£86	+ VAT –	£96.60
Mod A to Mod B upgrade kit	£50	+ VAT –	£57.50
Fitting charge for A to B upgrade kit	£20	+ VAT –	£23.00
16K memory upgrade kit	£20	+ VAT –	£23.00
Games paddles	£11	+ VAT –	£12.65
12" Monochrome monitor incl. cable	£89	+ VAT –	£102.35
16" Colour monitor incl. cable	£239	+ VAT –	£274.85
User guide	£10	+ VAT –	£10.00
Econet interface (free fitting)	£60	+ VAT –	£69.00
Speech interface (free fitting)	£47	+ VAT –	£54.05
BBC disk manual + formating disk	£30	+ VAT –	£34.50
Parallel printer cable	£10	+ VAT –	£11.50
BBC word processor (view)	£52	+ VAT –	£59.80
BBC Fourth language cassette	£15	+ VAT –	£17.25
BBC Lisp language cassette	£15	+ VAT –	£17.25

100% BBC COMPATIBLE MITSUBISHI AND TEAC SLIMLINE DISK DRIVES

These drives are supplied ready cased with all the necessary cables, formating program and user disk system guide.

There are some useful utilities included, e.g. Epson Screen Dump Program, Memory Dump, Free, Duplicate, Merge and Relocate. Power consumption of these drives is very low (0.2A typ. at + 12V, 0.4V typ. at + 5V per drive). Power is taken from the BBC computer.

Single drive 100K 40 tracks	£179	+ VAT –	£205.85
Dual drive 200K 40 tracks	£329	+ VAT –	£378.35
Single drive 400k 80 tracks	£239	+ VAT =	£274.85
Single drive 400k 40/80 tracks switchable	£259	+ VAT –	£297.85
Dual drive 800K 80 tracks	£449	+ VAT –	£516.35
Dual drive 800K 40/80 tracks switchable	£469	+ VAT –	£539.35

COMPLETE WORD PROCESSOR FOR ONLY £1,099 + VAT

This package consists of BBC Microcomputer, View, wordprocessor, 400K Slimline disc drive, High resolution 12" Green monitor, Juki 6100 18CPS Daisy Wheel printer and all the necessary cables and documentation. The above package can be supplied with components of your own choice, e.g. 800K disc drive or a different printer. Please 'phone us for a price for your particular requirement.

Special package deal £1,099 + VAT – £1,263.85

PROFESSIONAL MONITORS

GREEN MONITORS

12" Green screen monitors with composite and sync. input. Suitable for most computers.

✱ 18 MHz band width, high resolution	£89	+ VAT –	£102.35
✱ 15 MHz band width, normal resolution	£69	+ VAT –	£79.35

COLOUR MONITORS

✱ MICROVITEC RGB input 14+ monitor supplied with RGB lead for BBC	£239	+ VAT =	£274.85
✱ SANYO SCM 14" Normal res. 14", 400 dots, RGB input supplied with RGB lead	£199	+ VAT =	£228.85
✱ SANYO SCM 14M Medium res. 14", 600 dots, RGB input supplied with RGB lead	£299	+ VAT =	£343.85
✱ SANYO SCM 14 High res. 14", 800 dots, RGB Input supplied with RGB lead	£399	+ VAT =	£458.85

EPSON FOR RELIABILITY

EPSON FX80: 80 column, 160 CPS, normal, italic and elite characters, 256 user definable characters, superscript, subscript, 11 x 9 matrix, bi-directional logic seeking, hi-res bit image printing (960 x 8 dots/line), friction and pinfeed, 9 international character sets, Centronic parallel interface.

FX80 PRICE £349 + VAT = £401.35

EPSON RX80: 80 column, 100 CPS, normal, italic and elite characters, 11 international character sets, hi-res bit image printing, bi-directional logic seeking, 4" to 10" adjustable pin feed. Centronic parallel interface.

RX80 PRICE £239 + VAT = £274.85

MX-100 136 column, 100 CPS, friction and tractor feed, up to 15" adjustable carriage, hi-res bit image printing, true descenders, Centronic parallel interface.

FX100 160 CPS	£479	+ VAT =	£550.85
RS232 Interface for all above printers	£55	+ VAT =	£63.25
EPSON RX80 FT (Friction and tractor)	£269	+ VAT =	£309.35
SX100	£479	+ VAT =	£550.85
Roll holder for FX80	£12	+ VAT =	£13.80
Ribbon for MX80, FX80, RX80	£8	+ VAT –	£9.20
Ribbon for MX100	£12	+ VAT –	£13.80

SEIKOSHA DOT MATRIX PRINTERS WITH HIGH-RES GRAPHICS

GP-100A 80 column, 50 CPS, dot addressable hi-res graphics, 10" wide, fully adjustable, tractor feed, 7 x 5 print matrix, Centronic parallel interface.

GP-100A 50CPS PRICE £175 + VAT – £201.25

GP-250X 80 column, 50 CPS, 10" wide, fully adjustable, tractor feed, true descenders, 64 user definable characters, double height and/or double width printing, 8 x 5 print matrix, Centronic parallel and RS232 (serial) interfaces both included.

GP-250X PRICE £219 + VAT = £251.85

NEW GP-700A 7 COLOUR PRINTER

This latest addition to Seikosha range gives you print in seven colours, 10" wide carriage, friction and tractor feed, 50 CPS print speed, dot addressable high-res graphics, 4 hammer printing mechanism, 10 CPI or 13.3 CPI, special Quite printing mode, Centronic parallel interface.

GP-700A SPECIAL INTRODUCTORY PRICE £349 + VAT – £401.35

GUARANTEED LOWEST PRICES

We guarantee that our prices are the lowest on the market. If you can find any item advertised and in stock at less than our price we will match that price.

NEW LOW PRICES ON STAR

ONLY £239 + VAT

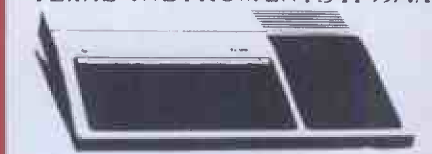
The most cost effective quality matrix printers to be launched this year. DP510 and DP515 features include friction and tractor feed and roll holders as standard. 100 CPS print speed bi-directional logic seeking 9 x 9 matrix gives true descenders. 2.3K buffer as standard hi-res bit image plus block graphics, sub and super script, italic printing, auto underlining, vertical and horizontal tabulation, left and right margins set, skip over perforation, back space and self test.

STAR DP510 10" carriage 80 columns.
SPECIAL PRICE £239 + VAT = £274.85
STAR DP515 15" carriage 136 columns.
SPECIAL PRICE £279+ VAT = £320.85
RS232 INTERFACE FOR ABOVE £50 + VAT – £57.50

POCKET COMPUTERS AND CALCULATORS

✱ CASIO PB-100 Basic language pocket computer, 544 program steps, Qwerty keyboard, 12 char display	£34.75	+ VAT –	£39.95
✱ CASIO FX-700P Basic language, scientific functions, 1568 program steps, Qwerty keyboard, 12 char display	£43.44	+ VAT –	£49.95
✱ CASIO PB-300 Basic language computer, scientific functions, 1568 program steps, built-in mini printer, Qwerty keyboard, rechargeable batteries and charger, 12 char display	£78.22	+ VAT –	£89.95
✱ CASIO FA-3 Cassette adaptor for PB100, PB300, FX700	£17.35	+ VAT –	£19.95
✱ CASIO FP-12 Printer for BB100 and FX700	£39.09	+ VAT –	£44.95
✱ SHARP PC-1211 Basic language computer, scientific functions, 1424 program steps, 24 char display, Qwerty keyboard	£60.83	+ VAT –	£69.95
✱ SHARP PC-1251 Basic language computer, 4K RAM, 24K system ROM, 24 char display, Qwerty keyboard, user defined key, numeric pad	£69.52	+ VAT –	£79.95
✱ SHARP CE-125 Cassette recorder and mini printer for use with PC-1251, incl batt charger	£86.91	+ VAT –	£99.95
✱ SPECIAL PRICE PC-1251 + CE-125	£146.95	+ VAT =	£169.00

TEXAS INSTRUMENTS TI 99/4A



This microcomputer is based on TMS9900 16-bit microprocessor. It includes 16K RAM, 16 colour high resolution graphic (192 x 256). The screen display is 32 characters, 24 lines TI-BASIC. Full-size keyboard. For Software there are about 1000 programs to choose from. There are a lot of peripherals available, e.g. Disk Drives, Disk Interface, Speech Synthesizer, Extra RAM. Additional Language (PASCAL, TI-LOGO, ASSEMBLER).

TI HOME COMPUTER HARDWARE

Title	Description	Price Inc VAT
T199/4A	Complete with UHF modulator and power supply	£99.95
PERIPHERALS		
Speech Synthesizer	When used with selected modules will roduce electronic speech	£41.95
Peripheral Expansion System	This unit takes all card peripherals and on internal disk drive	£79.95
Disk Drive – Internal	92K formatted drive, mounts internally in peripheral expansion system	£149.95
Disk Controller Card	Controls up to 3 disk drives, complete with disk manager command module	£109.95
Disk Drive Double Sided	92K formatted capacity per side acts as 2 drives DSK1 & DSK2 total capacity 184K bytes	£219.95
Disk Drive External	Complete with own case, power supply & connecting cables	£259.95
RS232 Expansion Card	Provides 2 serial RS232 ports, and one parallel port for interfacing	£79.95
RAM Expansion Card	Adds 32K bytes extra RAM bringing total capacity to 48K bytes	£79.95
P-Code Card	Includes the UCSD-PASCAL P-code interpreter	£139.95
Matrix Printer	80 column matrix printer pinter GP-100A + cable	£219.95
Matrix Printer GP250X	80 column matrix printer with RS232 and Centronic parallel interface	£273.95
Epson RX80 Printer	80 column, 100 CPS matrix printer	£299.95

Please send S.A.E. for software prices

THE AFFORDABLE DAISYWHEEL PRINTER

ONLY
£339
+ VAT

- ★ 18 CPS – Bi-Directional Logic Seeking
- ★ 10, 12, 15 CPI + Proportional Spacing
- ★ "Drop in" Daisywheel – Triumph Adler Compatible
- ★ Supports all Wordstar features
- ★ Diablo protocols – IBM Selectric ribbon
- ★ 2K Buffer as standard – 100 character Daisywheel

SPECIAL OFFER JUKI6100 DAISY WHEEL £339 + VAT = £389.85

THE CP80 QUALITY PRINTER

ONLY
£239
+ VAT

- ★ 80 CPS – Bi-Directional Logic Seeking 80 Column.
- ★ Friction and Adjustble Tractor Feed
- ★ Patented Square Needles up to 9 x 13 matrix
- ★ Hi-Res Graphics and Block Grphics

SHINWA CP80 PRINTER £239 + VAT = £274.85
SPARE RIBBON FOR CP80 £5 + VAT = £5.75

NEC 8023BE-C PRINTER

This is a high speed printer using bi-directional logic seeking operation, 7 x 9 matrix for alphanumerics, 8 x 8 for graphics and bit image printing. Programmable paper feed, original plus three copies. Greek characters and high resolution graphics. The print quality is exceptional, and the price is affordable.

Price £299 + VAT = £343.85

★ DK1 Microline 80 Printer	£199	+ VAT =	£228.85
★ DK1 Microline 82A Printer	£329	+ VAT –	£378.35
★ Dragon 32 Computer	£139	+ VAT =	£159.95

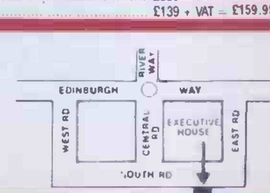
Akhter Instruments Limited

DEPT. PCW, EXECUTIVE HOUSE, SOUTH RD., TEMPLEFIELDS, HARLOW, ESSEX CM20 2BZ. UK.
TEL: HARLOW (0279) 443521 OR 412639
TELEX 995801 REF – A18

ORDERING INFORMATION

All orders which accompany a cheque, cash or postal orders are *CARRIAGE FREE* (UK only). Please make cheques and postal orders payable to "AKHTER INSTRUMENTS". A carriage charge of 3% of invoice total is applicable to BARCLAYCARD and ACCESS orders. We accept official orders from Government and Educational establishments. We accept VAT FREE EXPORT orders, please phone or write to check shipping cost.

OPENING HOURS: MON-FRI 9am-5.30pm, SAT 10am-2pm.
We welcome callers, no parking problems.

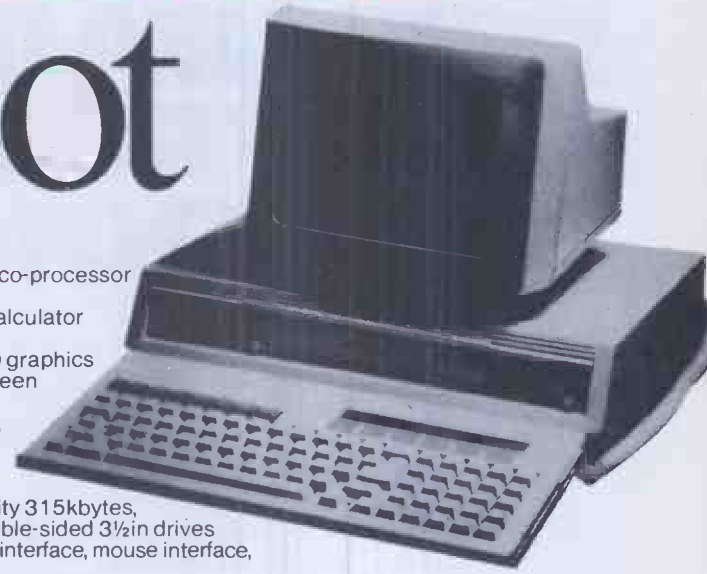


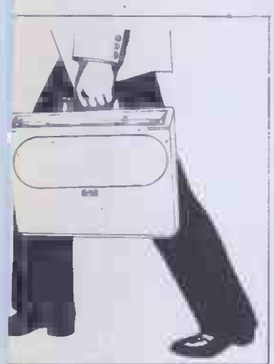
SILICON VALLEY

We make sure IT WORKS for you

NEW

apricot

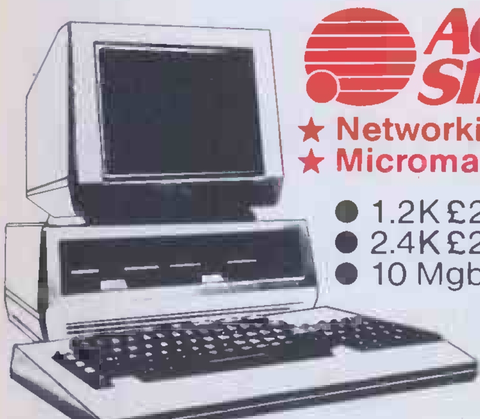




CPU	8086, 5MHz, optional 8087 maths co-processor
RAM	256k expandable to 768kbytes
ROM	k bootstrap ROM (also contains calculator software)
Display	25 lines x 80 characters, 800 x 400 graphics 2 line x 40 character LCD Microscreen display on keyboard
Keyboard	96 keys inc 8 pre-set function keys, 6 programmable touch-sensitive function keys, cursor control, numeric pad
Discs	One 3½in microfloppy drive, capacity 315kbytes, optional second drive, optional double-sided 3½in drives
I/O	One RS232, one Centronics parallel interface, mouse interface, optional audo-dial modem card
SOFTWARE	
System	CP/M-86, Concurrent CP/M-86, MS-DOS II, utilities
Languages	Microsoft & Digital Research Basic interpreters, Microsoft Basic & Cobol compilers run-time support; large range of optional languages
Applications	3D relational database, communications package, large range of optional packages including business, word processing, spreadsheet & database

Basic Apricot single drive plus monitor £1,640 + VAT
Dual drive plus monitor £1,895 or lease £10.20 per week

Order now to avoid disappointment later



ACT Sirius 1

★ Networking on Sirius
★ Micromail – the electronic post box

- 1.2K £2,195
- 2.4K £2,695
- 10 Mgbyte (Winchester) £3,995

Lease per week
1.2K – £11.84
2.4K – £14.50
10 Mgbyte (Winchester) – £21.50

No risk offer:
We are prepared to exchange this system within 3 months if your requirements are not met as specified at the time of sale.

We carry a full range of ACT office products

For these products
- We are established main dealers
- We give the best support
- We give the advice
- We supply the software
- We do on site maintenance

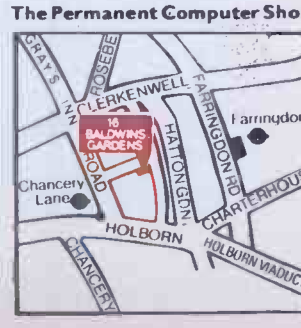
And we are always in stock!!
Silicon Valley has on site Chartered Accountants, management consultants specialist, computer engineers to discuss and recommend solutions. We offer full training and maintenance – **TRY US OUT**

London	Manchester
Suite 104/5	12 Lever Street
16 Baldwins Gardens	Piccadilly
London EC1N 7RJ	Manchester

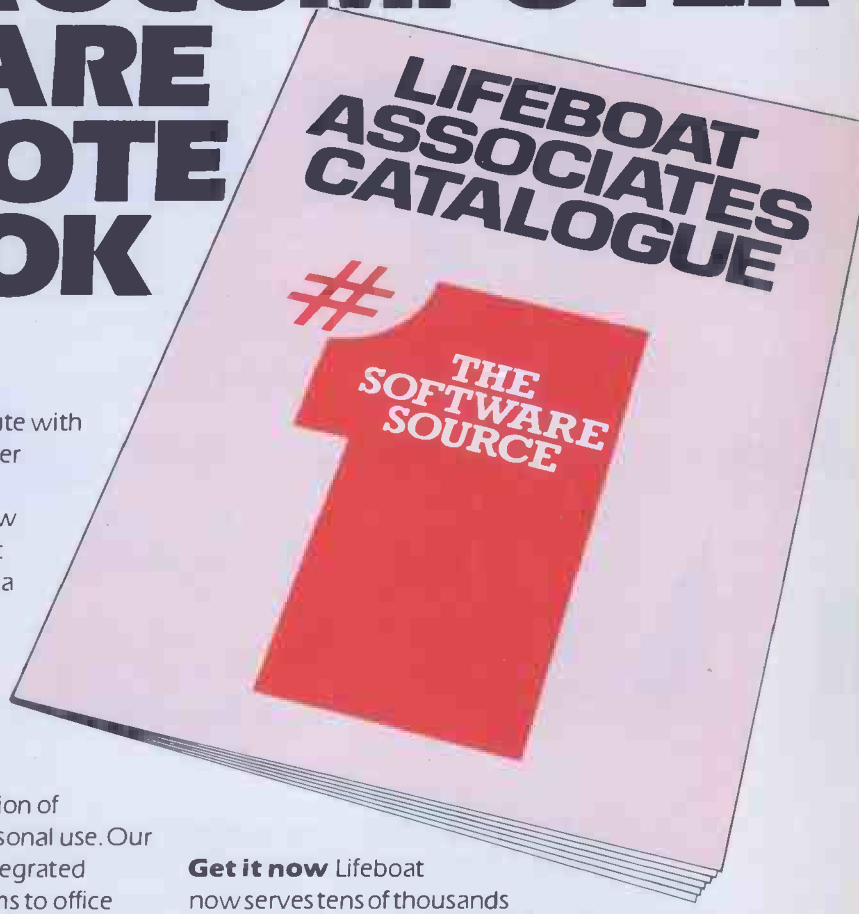
SILICON VALLEY COMPUTER CENTRE

Tel: 01-242 2803 **Tel: 061-228 1686**

The Permanent Computer Show



WHEN IT COMES TO MICROCOMPUTER SOFTWARE WE WROTE THE BOOK



How do you stay up-to-the-minute with the rapidly changing world of microcomputer software? Get the Lifeboat Catalogue.

The latest innovations The new Lifeboat Catalogue is packed with the latest state-of-the-art software. And if we publish a new program after the latest catalogue has gone to press, we enclose a flash bulletin in your copy.

The greatest selection Because Lifeboat is the world's largest publisher of microcomputer software, our catalogue offers you the greatest selection of programs for business, professional and personal use. Our more than 200 programs range from the integrated accounting and professional practice systems to office tools for book-keepers and secretaries to sophisticated tools for programmers. Included are business systems, word processors, programming languages, database management systems, application tools and advanced system utilities.

We specialise in software that runs on most small business computers. Our more than 60 media formats, including floppy disks, data cartridges, magnetic tape and disk cartridges, support well over 100 different types of computer.

Get full service We give the crucial dimension of after-sales service and full support to everything we sell.

That includes:

- An update service for software and documentation.
- Telephone, telex and mail-order services in the London office and at overseas offices in the United States, France, Switzerland, West Germany and Japan.
- Subscriptions to Lifelines,™ the monthly magazine that offers comparative reviews, tips, techniques, identified bugs and updates that keep you abreast of change.

Get it now Lifeboat now serves tens of thousands of satisfied customers with our breadth of up-to-date, fully tested, fully supported and competitively priced software.

You may not need all we offer, but we offer just what you need. After all, we wrote the book.

#1 Lifeboat Associates
World's foremost software source

Mail coupon to: Lifeboat Associates
PO Box 125, London WC2H 9LU or call 01-836 9028

☐ Please send me a free lifeboat catalogue.

Name

Title

Company

Address

Postcode

 PCW/11/83

Lifeboat Worldwide offers you the world's largest library of software. Contact your nearest dealer of Lifeboat.

USA Lifeboat Associates 1651 Third Ave. New York NY 10028 Tel (212) 860-0300 Telex 640693 (LBSOFT NYK) TWX 710 581-2524 **JAPAN** Lifeboat Inc. OK Bldg. 5F 1-2-8 Shiba-Daimon Minato-ku Tokyo 105 Japan Tel 03-437-3901 Telex 2423296 (LBJTYO) **ENGLAND** Lifeboat Associates Ltd PO Box 125 London WC2H 9LU England Tel 01-836 9028 Telex 893709 (LBSOFTG) **SWITZERLAND** Lifeboat Associates GmbH Hinterbergstrasse Postfach 251 6330 Cham Switzerland Tel 042-36-8686 Telex 865265 (MICO CH) **W GERMANY** Intersoft GmbH Schlossgartenweg 5 D-8045 Ismaning W. Germany Tel 089-966-444 Telex 5213643 (ISOFD) **FRANCE** Lifeboat Associates SARL 10 Grande Rue Charles de Gaulle 92600 Asnieres France Tel 1-733-08-04 Telex 250303 (PUBLIC X PARIS)

Discover the Microcomputer Age

Come along to The Northern Computer Fair and discover for yourself the excitement of the microcomputer age. All you need to know about personal computers, home computers and microcomputer systems for business will be on display at Belle Vue, Manchester from November 24-26. All your questions will be answered at the North's premier personal computer exhibition.

Enthusiasts can see the latest software and hardware technology in action, and for those new to the world of computers this show is a great introduction. Being sponsored by Practical Computing and Your Computer, the leading microcomputing magazines, you can be sure of value for money at £3 a ticket for Adults and £2 for Children under 16.

Travelling to the show is also easy as the organisers have arranged special reduced-price tickets with British Rail which include the cost of admission. For further information ring British Rail Enquiry Bureau on 061-832-8353 before November 11.

The Northern Computer Fair is open between 10.00 am and 6.00 pm every day so come along and bring the microcomputer age alive for you.

For special party rates and further information contact:
The Exhibition Manager,
The Northern Computer Fair,
Reed Exhibitions, Surrey House,
1 Throwley Way, Sutton,
Surrey SM1 4QQ

Sponsored by:

Practical Computing and YOUR COMPUTER

THE **Northern Computer Fair**

Personal computers
Home computing
Small business systems

Belle Vue Manchester November 24-26, 1983

WATFORD ELECTRONICS

33 (PCW) Cardiff Road, Watford, Herts, England
Tel: Watford (0923) 40588. Telex: 8956095

ALL DEVICES FULLY GUARANTEED. Send Cheque, P.O.s, Cash, Bank Draft with Orders. ACCESS/MASTER CHARGE Accepted. GOVERNMENT & EDUCATIONAL ESTABLISHMENTS OFFICIAL ORDERS WELCOME. P&P add 60p to all Cash Orders. OVERSEAS Orders postage at cost. Prices subject to change.

VAT ALL PRICES ARE EXCLUSIVE OF VAT. PLEASE ADD 15% TO THE TOTAL COST INCLUDING P&P. SHOP HOURS: 9.00am-6.00pm MONDAY TO SATURDAY. AMPLE FREE CAR PARKING SPACE AVAILABLE. FOR QUANTITY PRICES PHONE WATFORD (0923) 40588

Computer IC's

27L08	450
27L32	550
2114L-200n	96
2147-3	395
2532 450n	300
2564	£6
2708	285
2716-5V	270
2732-250n	320
2764-250n	425
27128-250	£20
27128-400	£18
3242	590
4116-200	90
4116-200	90
4118-250	325
4164-200	425
4532-3	220
4815A-100nS	225
4816	250
5101	220
6116-150	340
6116L-120nS	525
6117-100n	490
6187-6	795
6502A	450
6502 CPU	325
6503	800
6521	125
6522VIA	285
6530 RRIOT	£11
6532 RIOT	570
6545 CRTC	999
6551 ACIA	650
6800	220
6802	250
6803	350
6804	160
6805	670
6808	520
6809	630
6810	115
6821	100
68821	220
6840	375
6843	£12
6845	750
6846	625
6847	850
6850	110
6852	250
6854	599
68854	950
6859	£4
6875	500
68000	£68
74C922	400
8035	600
8080A	350
8085A	250
8088	£18
81LS95	120
81LS96	120
81LS97	120
81LS98	120
8118-10	250
8123	125
8155	350
8156	350
8202	£25
8212	150
8214	425
8215A-300	300
8216	100
8224	150
8225	£11
8226	250
8228	220
8243	270
8250	850
8251	250
8253	400
8255	255
8256A	£35
8257A	400
8259	395
8271	£36
8279	335
8282	450
8283	450
8284	350
8285	365
8287	£17
8288	£10
8T26A	99
8T27	150
8T28A	120
8T31	350
8T95N	90
8T97N	90
9364AP	550
9602	220
AM26LS31/2	125
AY-3-1015	300
AY-3-1270	875
AY-3-8910	375
AY-3-9812	625
AY-5-1013	300
AY-5-1350	388
AY-5-2376	600
AY-5-3600	750
COM8017	275
COM8116	700
DM8131	275
DP8304BN	250
DS3691	320
DS3691N	320
DS88LS120N	275

DS8820	110
DS8830	110
DS8831	125
E9336	£38
FD1691	£15
FD1771	£15
FD1791	£22
FD1793	£23
FD1795	£28
FD1797	£28
IM6402	300
INS8080N	1060
INS8154N	£9
MC1488	55
MC1489	55
MC14411	675
MC14412	725
MC3446	215
MC3447P	315
MC6846	625
MM5280D	595
MM5303	635
MM5307	1275
MM5387A	475
MM58174	700
RO-3-2513L	550
RO-3-2513L	850
RO-3-2513U	900
SFF96364E	800
SP0256	£9
SP0256AL2	£10
TMS2716-3	725
TMS4164-15	395
TMS4500	£14
TMS5100	600
TMS9927	£14
TMS9929	£16
TMS9995	£12
ULN2003	75
UPD7002	425
Z80CPU2.5	285
Z80ACPU	300
Z80B	875
Z80CTC	250
Z80ACTC	260
Z80DART	698
Z80ADART	495
Z80DMA	695
Z80ADMA	895
Z80P10	280
Z80AP10	275
Z80S10	850
Z80AS10	900
ZN419	180
ZN423E	138
ZN424E	130
ZN425E-8	345
ZN426E-8	300
ZN427	130
ZN428E	410
ZN429E-8	210
ZN459	570
ZN1034E	200
ZN1040	665
ZNA234E	850

74S Series

74S00	30
74S02	30
74S03	32
74S04	30
74S06	40
74S10	40
74S11	50
74S20	40
74S22	50
74S27	60
74S32	70
74S37	60
74S74	75
74S85	295
74S112	80
74S113	90
74S124	300
74S132	110
74S133	60
74S138	100
74S139	115
74S140	60
74S151	180
74S153	182
74S155	39
74S158	195
74S163	300
74S174	250
74S175	260
74S188	140
74S189	140
74S194	295
74S195	275
74S197	400
74S201	250
74S225	240
74S240	390
74S241	250
74S244	290
74S251	225
74S257	225
74S258	250
74S260	50
74S260	70
74S262	950
74S287	225
74S288	210
74S289	200
74S299	540
74S301	350
74S365	250
74S373	400
74S374	365
74S412	380
74S470	325
74S471	620
74S472	1150
74S474	400
74S475	25
74S571	620
74S573	950

75 Serics

75107/8	95
75150/54	125
75154	125
75159	195
75182/3	99
75188/9	55
7532	140
75450	86
75451/2	52
75454	70
75491/2	65

74LS

LS00	15
LS02	15
LS04	15
LS08	18
LS10	18
LS11	18
LS13	22
LS14	36
LS19	58
LS20	18
LS22	18
LS27	18
LS30	18
LS32	18
LS40	20
LS42	32
LS47	38
LS48	40
LS63	120
LS72	20
LS73	22
LS74	22
LS75	32
LS85	45
LS86	28
LS90	25
LS91	50
LS92	25
LS93	25
LS125	32
LS126	32
LS36	24
LS138	30
LS139	34
LS148	95
LS151	40
LS153	40
LS156	36
LS157	25
LS158	30
LS175	36
LS240	60
LS241	60
LS242	68
LS243	68
LS244	53
LS245	85
LS273	54
LS362	750
LS364	140
LS373	60
LS374	60
LS393	50
LS471	629
LS640	180
LS641	180
LS645	180
LS668	125
LS669	120
LS670	110
LS673	560

CMOS

4000	14
4001	14
4002	14
4007	15
4009	24
4010	24
4011	15
4012	18
4016	20
4017	32
4018	45
4023	15
4025	16
4027	20
4034	140
4039	280
4040	40
4051	45
4052	60
4053	50
4066	24
4068	18
4069	13
4070	18
4071	20
4072	18
4073	20
4075	18
4076	18
4077	18
4078	18
4081	18
4082	18
4093	20
4097	275
4099	75
4160	35
4161	99
4162	99
4163	99
4174	99
4175	105
4411	000
4412	790
4419	350
4450	350
4451	350
4490	350
4500	375
4504	75
4505	185
4508	130
4511	46
4512	45
4519	30
4526	60
4528	50
4532	50
4549	375
4568	175
4583	90
4584	40
4585	70
4597	330
4598	290
4599	290
40101	130
40105	105
40105	25
40108	198
40109	100
40110	225
40114	240
40163	50
40193	95
40244	195
40245	195
40373	160
40374	245
45106	595

SEIKOSHA GP-700

The Colour Printer that has broken all price barriers.

A 7 colour graphic printer at the price of a standard Dot matrix printer. Its unique 4 hammer method enables text & high res graphics to be drawn in 7 basic colours or 30 shades. 7 x 8 matrix. Up to 106 char. per line at 50 CPS. Variable line spacing at 1/120". Tractor or Friction feed. Centronix interface standard.

Special introductory offer
£399

BBC MICRO & UPGRADE KITS

Upgrade your BBC Micro with our Upgrade Kits and save yourself £££s . . .

- Model A **£299**; Model B **£399** (incl)
- 16K Memory (8 x 4816AP-100nS) BBC1 **£20.00**
- Printer User I/O Port BBC2 **£7.00**
- Disc Interface Kit BBC3 **£85.00**
- Analogue I/O Kit BBC4 **£7.00**
- Serial I/O Kit BBC5 **£7.30**
- Expansion Bus Kit BBC6 **£6.60**
- Model A to Model B Upgrade Kit **£50.00**
- Joysticks for BBC (per pair) **£11.50**
- Complete range of Connectors & Cables available. Send SAE for list.

We specialise in BBC Peripherals, Software and Accessories.

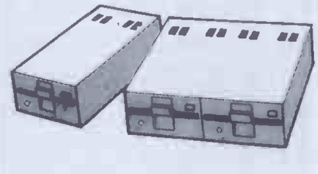
Now available from stock:

BeebPlot; BeebMon; BeebProgrammer; Beeb 62File DOS; Beeb 13 ROM Socket; BeebPlotter.

SEND S.A.E. FOR FULL LIST

TEAC DISC DRIVES

BBC compatible



- 12 Months Warranty on DRIVES
- CS50 – **TEAC** Single Cased with PSU, 40 track, 5¼" S/S, 100K **£180**
- CD50 – Twin Cased with PSU, 40 track, 5¼", S/S, 200K **£350**
- CS50E – Single Cased with PSU. 80 track, 5¼", S/S, 200K **£250**
- CD50E – Twin Cased with PSU, 80 track, 5¼", S/S, 400K **£475**
- CS50F – Single Cased with PSU, 80 track, 5¼", D/S, 400K **£330**
- CD50F – Twin Cased with PSU, 80 track, 5¼", D/S, 800K **£599**
- MITSUBISHI SLIM LINE: Uncased, Double track, Double Density, ONE MEGA-BYTES. Track Density 96TPI, Track to Track access time 3m3sec **£225**
- Drive Cable for BBC: **Single £8; Double £12**
- VERBATIM or 3M DISKETTES (2 years warranty) 10x5¼" SSSD **£20** 10x5¼" DSDD **£30**

N.B. Carriage is extra

NEC PC0923-C

Bi-directional, 80 column, 100CPS, Logic seeking, Hi-Res, block graphic Forward and Reverse line feed, proportional spacing, true descenders, 2K buffer, at a giveaway price:
Only £320 (£7 car)

SEIKOSHA GP100A

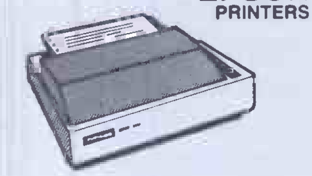
Unihammer Printer, gives normal and double width characters as well as dot resolution graphics 10" Tractor feed. Parallel interface standard. **£175**
SEIKOSHA BP250X Only £235
Securicor Carriage £7.

BROTHER 8300 DAISY WHEEL PRINTER/TYPEWRITER

Provides very high quality type in any six interchangeable style typefaces. It is therefore ideal for business use. Portable. Can also be used as a standard-alone typewriter. Centronics interface standard. Friction feed; 11 CPS; 12" max width; 5 different colour ribbons. Hard Cover with carrying handle. **Only £399**

Just phone your order through, we do the rest. Tel: (0923) 50234

EPSON PRINTERS



FX80

10" Tractor/Friction feed, 160 CPS, 11x9 matrix, 137 columns max, Bidirectional, Logic seeking, proportional spacing, Hi-res bit image, Italic & Elite characters, underlining, subscript & superscript.
Only £375 (£7 carr)

RX80

100 CPS, 9x9 matrix, dot addressable graphics, Condensed & Double width printing, Normal, Italics & Elite characters, Tractor Feed, Bi-directional, logic seeking, Centronics Interface standard.
Only £275 (£7 carr)

MX100FT/3

136 columns, 15" carriage, plus all the facilities of MX80FT.
Only £425 (£7 carr)

ACCESSORIES

- **TEX EPROM ERASER.** Erases up to 32 ICs in 15-30 min. **£33**
- **TEX EPROM ERASER** with incorporated Safety Switch **£38**
- **Electronic Timer** Solid state. Connects directly to above Erasers. Protects your expensive Chips from overcooking. Our timer pays for itself in no time. **£15**
- **Tex Eprom Eraser** including the Electronic timer. **£44**
- **Spare** UV lamp bulbs **£9**
- POWER SUPPLY Regulated, overload protection. Variable: 5V to 1.5V @ 4A **£38**
- **Multirail psu** kit including Case. Output: +5V/5A; +12V, +25V, −5V, −12V @ 1A. **Only £39 (p&p 95p)**
- Attractive Beige Brown **ABS CASE** for Superboard/UK101 or Home Brew **£26**
- **C12 Cassettes** in Library Cases **40p**
- **8" Fan fold paper** (1000 sheets) **£7**
- **9½" Fan fold paper** (1000 sheets) **£7**
- **Teleprinter Roll** **250p**
- **UHF Modulator 6MH2** **350p**
- **UHF Modulator 8MH2** **450p**
- **Stack Pack** the unique stackable twin drawer racking system for Computer Cassettes. 5 Drawers (10 sections) including 10 x C12 Computer Cassettes and Labels **£6**

CRYSTALS

32 768KH	100	7.6MHz	200
100KHz	236	8.0MHz	150
1MHz	275	8.0833M	395
1.28MHz	392	8.86723	175
1.6MHz	392	9.0MHz	200
1.8MHz	395	9.375M	350
1.843M	200	10.0MHz	175
2.0MHz	225	10.7MHz	150
2.457M	200	10.24MHz	200
3.276MHz	160	12.0MHz	175
3.2768M	150	12.528M	300
3.57594	98	14.31818	170
3.6864M	300	16.0MHz	200
4.0MHz	150	18.0MHz	180
4.032MHz	290	18.432M	150
4.194304	200	19.968M	150
4.433619	100	20.0MHz	200
4.80MHz	200	24.0MHz	170
5.0MHz	160	24.930M	325
5.185MHz	300	48.0M	175
5.24288	390	100.0M	375
6.0MHz	140		
6.144MHz	150		
6.5536M	200		
7.0MHz	150		
7.7328M	250		
7.168MHz	160		

IDC Connectors:

Speed Block type	PCB PLug with latch Strut Pins	PCB PLug with latch Angle Pins	Female Header Socket	Female Card-Edge Connectors
Two rows				
10 way	90p	99p	85p	120p
16 way	130p	150p	110p	—
20 way	145p	166p	125p	195p
26 way	175p	200p	150p	240p
34 way	205p	236p	160p	320p
40 way	220p	250p	190p	340p
50 way	235p	270p	200p	395p

JUMPER LEADS Ribbon Cable Assembly/DIL Plug (Headers)
Single Ended Lead 24" Long

Length	14pin	16pin	24pin	40pin
24"	145p	165p	240p	325p
Double Ended Leads				
6"	185p	205p	300p	465p
12"	198p	215p	315p	490p
24"	219p	235p	345p	540p
36"	230p	250p	375p	595p

IDC FEMALE RECEPTACLE JUMPER LEADS

24"	20way	26way	34way	4way
1end	160p	200p	260p	300p
2end	290p	370p	480p	525p

DIL SOCKETS

	Low Prof	Wire Wrap
8pin	8p	25p
14pin	10p	35p
16pin	10p	42p
18pin	16p	52p
20pin	22p	60p
22pin	25p	70p
24pin	25p	70p
28pin	28p	80p
40pin	30p	99p

RIBBON CABLE

Ways	Grey Price per Foot	Colour Price per Foot
10	15p	28p
16	25p	40p
20	30p	50p
26	40p	65p
34	60p	85p
40	70p	90p
64	120p	160p

DIL PLUGS (Header)

	Solder	IDC
14pin	40p	99p
16pin	49p	106p
24pin	88p	170p
40pin	250p	265p

AMPHENOL PLUGS

24 way IEEEE	475p
26 way Centronics Parallel	485p

ZIF DIL SOCKETS

24 way	565p
28 way	750
40 way	975p

VIDEO MONITORS

- ZENITH 12" Hi-Res. Green Monitor. 40/80 column select switch. Attractively finished £80
- KAGA RGB 12" Standard Res. Colour £199
- KAGA RGB 12" Medium Res. Colour £240
- MICROVITEC 1431. 14" Colour Monitor. RGB Input Cable included £225
- Connecting lead for KAGA £5

EURO (DIN) CONNECTORS

Gold Flashed Contacts DIN41617	Female Strt. Pins	Female Angle Pins	Male Strt. Pins	Male Angle Pins
31 way	170p	—	—	175p
41612 A + B 2 x 32 way	275p	320p	220p	285p
41612 A + C 2 x 32 way	295p	340p	240p	300p
41612 ABC *3 x 32 way	360p	385p	260p	395p

EDGE CONNECTORS

TWO ROWS	.1"	.156"
2x18 way	160p	145p
2x22 way	199p	200p
2x23 way	185p	
2x25 way	225p	220p
2x28 way	210p	
2x30 way	245p	
2x36 way	295p	
2x40 way	315p	
2x43 way	395p	

D CONNECTORS: Miniature

	3 way	15 way	25 way	37 way
Male				
Solder	80p	110p	160p	250p
Angle	160p	210p	250p	355p
Pins	120p	130p	195p	295p
Female				
Solder	110p	160p	210p	350p
Angle	165p	215p	290p	440p
Pins	150p	180p	240p	420p
Covers	85p	80p	80p	100p

IDC 25 way 'D' plug 385p Skt 450p

DEANS AT EDGWARE RD

THE MOST FAMOUS BARGAIN STREET IN THE U.K. FOR COMPUTERS, HI-FI AND VIDEOS

JUST ARRIVING THE NEW MTX SERIES

MTX 512 64k user RAM
MTX 500 32k user RAM

Newly arrived at Deans the most versatile computer on the market, the MTX's 16k ROM contains several languages and routines, the standard languages are MTX Basic logo and Noddy. ROM routines include an assembler/disassembler with screen display of the Z80 CPU registers, memory and program which can be manipulated from the keyboard. Other features are the virtual screen facility; Pascal is available as an add-on ROM Pack; standard 32k of user RAM expandable to 512k plus 16k of dedicated video RAM, 16 colours; 40 column text; 256 × 192 high resolution graphics with all 16 colours available.

Memotech MTX 512

This fantastic new machine is now available at

DEANS: MTX 512 (64k user memory) **£315** (inc. VAT).
MTX 500 (32k user memory) **£275** (inc. VAT).

SOON AVAILABLE FDX floppy disc system, HDX Winchester disc system. Expansions for FDX and HDX. Internal expansions memory boards — 32k RAM, 64k RAM, 128k RAM, 256k RAM.
Communications Board, Dual RS232 Interfaces and disc drive bus (required for disk based systems).

BOOKS AND SOFTWARE

Deans at Edgware Road stock a wide range of computer books from machine language to games and business programs. We also stock a large range of software for the Spectrum, Commodore, BBC, Sharp 700, Texas and the new MTX series computers. We have experts in computer programming to give you advice, but if you are unable to travel into town we will be happy to send you our list of hardware, books and software.

If you wish to buy through mail order, please send orders with cheque payable to Deans.

The new Sharp MZ-711 with optional data recorder (MZ ITO1) and colour plotter printer MZ-IP01

NOW IN STOCK

MZ 711 .... **£249**
MZ ITO1 .... **£39.95**
MZ IP01 .... **£129.95**

AND A WIDE RANGE OF BUSINESS AND GAMES SOFTWARE

SINCLAIR ZX COMPUTERS

SPECTRUM 48k......... **£125**
SPECTRUM 16k........... **£95**
D'K TRONICS KEYBOARD **£39**
LIGHT PEN FOR GRAPHICS **£19.95**
ZX81 SPECIAL PACK **£45** (16 RAM + 1 free game)

MEMOTECH

16k RAM **£24.95**
32k RAM **£34.95**
64k RAM **£49.95**
High resolution graphics **£24.95**
Memotech Keyboard **£34.95**

DEANS AT EDGWARE ROAD

283, EDGWARE RD
LONDON W.2.

TEL: 723 4630
724 2135

ALL PRICES INCLUDE VAT

COMMODORE 64
£229
Now in stock and a large range of software

BBC MODEL B
£399
Now in stock and a large range of software

SHARP MZ80A
£389
BARGAIN PRICE

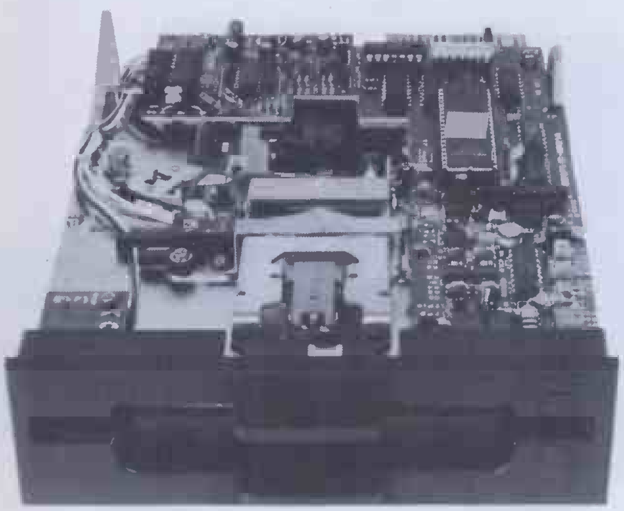
TEXAS INSTRUMENTS
£99.95
Joysticks and large range of software

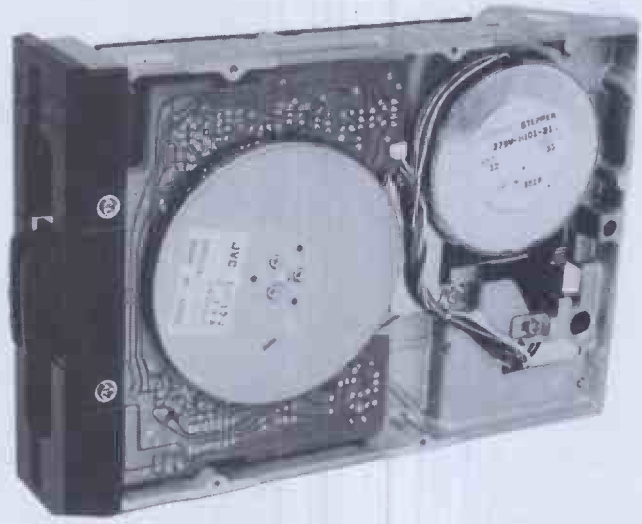
SHARP PORTABLE COMPUTERS

PC 1251............ **£69.95**
CE 125.............. **£89.95**
PC 1500........... **£149.95**
CE 150............ **£159.95**
CE 152.............. **£34.95**
CE 153.............. **£69.95**
CE 155.............. **£79.95**

KOMORI FDD 155 INTELLIGENT 5¼″ FLOPPY DISK DRIVE

ONE DAY ALL DISK DRIVES WILL BE MADE THIS WAY





The first of a new generation microprocessor controlled 5¼″ floppy disk drive from Komori opens up the generation gap in disk drive technology.

Ideal for BBC Micro, Tandy, Nascom, Genie, Micronix and any other computers with industry standard Shugart Interface. Apple version with built-in controller is also available.

★ 5¼″ slimline, half height

★ Microprocessor controlled

★ On-board single chip microcomputer reduces TTL count by approx. 70% and enhances reliability

★ Less serviceable parts mean greater reliability

★ Industry standard Shugart interface — Apple version also available

★ Ultra low power requirement
+5V @ 600mA
+12V @ 350mA (190mA typical)

★ 40 track (48 TPI) single sided, single/double density, 250K unformatted — 200K formatted (double density). BBC format — 100K (single density).

★ Direct drive DC motor — no belts!

★ Metal band actuator & unique guide rail mean completely quiet operation

★ Unique disk eject mechanism

★ Fast 6mS track to track access time

★ Competitively priced

★ Fully guaranteed

EXCLUSIVE UK DISTRIBUTOR OF KOMORI DRIVES

micronix computers Ltd

Suite 2, 26 Charing Cross Road, London WC2. Tel. 01-240 0213/0217. Telex. 295173 VILORD G

ATA The market leaders!...

apple Package!

Consisting of Apple IIe Computer Disc Drive with Controller High Resolution 12" Monitor and Apple 80 col card

ONLY- £999

ATA'S philosophy is to ensure that our customers have quality computer hardware and software products at COMPETITIVE prices, together with technical assistance required to efficiently operate their computer system.

***Export specialists** — ring or telex for details*

...with recognised professional support

Apple Hardware

Apple IIe

	£
Apple IIe 64K	645.00
Disk drive with controller	270.00
Disk drive	200.00
III Monitor including stand	120.00
Phoenix hi-res green 12" monitor	99.00
Phoenix hi-res amber 12" monitor	105.00

Apple III

Apple III 256K including Monitor III, Disk drive & SOS	1980.00
Additional 5.25" disk drive	270.00
Profile 5mb Winchester	1495.00

Accessories

80 column card	65.00
80 column card 64K extended	145.00
Numeric keypad (//e)	85.00
Numeric keypad (][+)	75.00
T.V. modulator with sound	12.00
Videx Videoterm 80 column card	195.00
Videx Soft Switch (40/80 column)	20.00
Videx Keyboard Enhancer	87.00
Videx Inverse ROM and character sets	18.00
Microsoft Softcard (Z80 CP/M)	199.00
Microsoft Softcard Apple III (Z80 CP/M)	265.00
Accelerator card (3.6 mHz 6502C & 64K)	289.00
Joystick (//e)	29.00
Joystick (][+)	22.00
System Saver fan & voltage reg.	59.00
Dust cover for Apple II	6.50
Dust cover for Apple II 2 x DD & 12" minitor	9.00
Dust cover for Apple III & Monitor III	11.99

Colour Monitors

Luxor high resolution 25Mhz linear & TTL	499.00
Kaga Denshi medium resolution TTL	325.00
Kaga Denshi low resolution	265.00

We also stock the Hantarex RGB monitors, as recommended by Apple in Europe.

PRICES EXCLUSIVE OF VAT AND CURRENT AT TIME OF PRINTING

Interfaces

	£
Apple RS232 Super Serial card	99.00
Apple IFEE 488 card	205.00
Apple parallel interface with cable	99.00
Apple III parallel interface with cable	130.00
CCS 7710-01 RS232 serial interface	109.00
Grappler + parallel graphics interface	105.00
PACT 8 bit A/D converter	115.00
Keyzone 12 bit A/D converter	138.00
PACT 12 channel D/A converter	125.00
RGB card TTL/analog output (programmable)	99.00
RGB card TTL output	85.00

Digitek Accessories & Interfaces

64K RAM	199.00
128K RAM	299.00
PrintMaster parallel printer interfaces available for Anadex, Epson, Centronics, Citoh, NEC & TEC	75.00
Super PrintMaster III interface available for all printers as above and also for the Apple Dot Matrix printer	100.00
RS232 high speed serial interface	80.00
Z80 with manuals	149.00
Screenmaster 80 inc. soft switch inverse video, 3 scroll speeds & altern. chr. sets	185.00
Eurocolour card with modulator (][+)	95.00
UHF Modulator with 'clean signal'	39.00

Robocom Bit Stik C.A.D. Graphics System

Robocom Bit Stik 1.1 system	230.00
Robocom Bit Stik 1000 upgrade software	190.00
Robocom Bit Stik 1000 system package	415.00
Plotter driver for A4 and A3 plotters	90.00

Kappro II

FRESH FROM THE U.S.A.! The best value Portable Micro from Kaypro . . . Including Software

	£
KAYPRO II 2 x 200K disc drives	1695.00
KAYPRO IV 2 x 400K disc drives	1950.00

KAYPRO X 1 x 400K disc drive and built in 20MB Winchester

Other Software including financial ledgers etc also available.

Hyperion

Hyperion 256 x 2 MSDOS, BASIC	£2950.00

Printers & Plotters

Epson

Epson RX80 120 CPS	260.00
Epson FX80 160CPS	350.00
Epson MX100 100CPS	420.00

Apple

Apple Dot Matrix 120 CPS	349.00
Apple Letter Quality Printer	1199.00

Ricoh

Ricoh 1300 Flow Writer	1099.00
Ricoh RP1600 Flow Writer	1499.00
Mannesmann Tally MT160L	550.00
Mannesmann Tally MT180L	690.00

Plus full range of Centronics Printers Available.

Plotters

Hewlett Packard HP7470	1066.00
Hewlett Packard HP7475(A3)	TBA
Calcomp 8 PEN (A3)	2999.00

WE ALSO STOCK APPLE IBM AND HEWLETT PACKARD

TERMS AND CONDITIONS
For delivery please add £0-£199 + £5, £200-£1499 + £13 £1500 + 1½%.

CHEQUES WITH ORDERS
Please allow 10 days for clearance. PLC's, public sector etc 30 days credit available on official orders, subject to 5% credit charge.

ATA — LONDON 4 Albion Hse, 1 Back Hill, London EC1. 01-833 0044 Telex 25102 CHACOM G

ATA — ST ALBANS 70 Park Street, St Albans. 0727 74361

ATA — SHEFFIELD 72 Eldon Street, Sheffield, S1 4GT. (0742) 700802
FREEPOST SHEFFIELD S1 1AY

Apple III 256K
WITH DISK DRIVE AND MONITOR III
£1980

ATA

GET MORE FROM YOUR 64. WITH VIZAWRITE 64.

ONLY £69 plus VAT

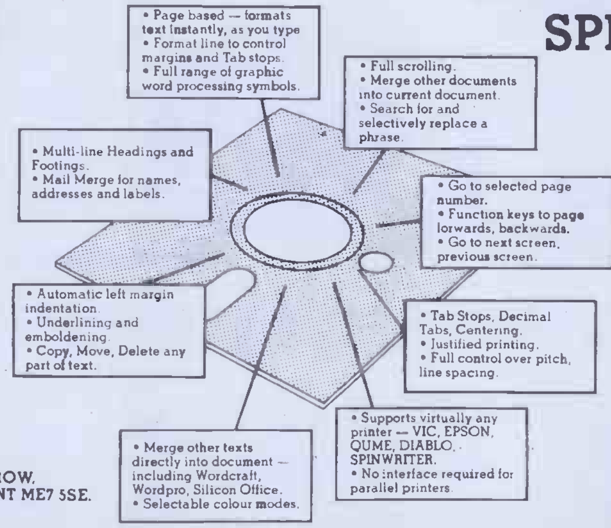
THE PERSONAL WORD PROCESSOR

Vizawrite 64 is a high performance, low-cost word processor designed especially for the Commodore 64 computer. Vizawrite 64 takes full advantage of the colour, graphics and memory capabilities of the computer to bring you the power and style of a dedicated word processor.

Serious word processor users expect their word processor to format their text as they type, Vizawrite 64 does this instantly. Tabs, indentation, centring are all clearly visible and easily altered, so you know exactly the format of your text all the time.

Vizawrite 64 is a disk-based word processing program — it is available NOW from your local Commodore dealer or direct from Viza Software. It costs just £69.00 plus VAT (£79.35).

VIZAWRITE 64 SPECIFICATIONS



NOW AVAILABLE ON CARTRIDGE

NOW AVAILABLE AT LASKYS

Limited Edition VIZAWRITE 64 + VIZASPELL 64 £99.00 Including V.A.T.

VIZA SOFTWARE

VIZA SOFTWARE, 9 MANSION ROW, BROMPTON, GILLINGHAM, KENT ME7 5SE.
TEL: MEDWAY (0634) 813780.
Dealer enquiries welcome.

Print

Listings 200 LPM (600 Characters - Per - Second)	
Data Processing 150 LPM (330 Characters - Per - Second)	
Word Processing 80 LPM (180 Characters - Per - Second)	
Wordstar compatible	140 Character Sets
Underlining and Double Height	6 part copy
Forms length switch (downloadable)	Programmable handshake

Graphics

Speed	ins/min	Resolution dots/inch
High	27.8	50 x 50
Medium	16.7	60 x 72
Low	8.3	100 x 100

Optional Label/Forms/Barcode processor

The above brief specifications show that the MVP will replace the Daisy wheel printer, the Serial Matrix printer, and the Graphics plotter. Speeds for Word Processing, are 4-5 times faster than Daisy wheel printers and Bar Code printing is 10-40 times faster than a serial matrix printer. Whether for a single user, a multiple user, a network system, for business, scientific, engineering; the MVP is the Total Solution.

Send for detailed literature and print samples

TRADE AND END USER ENQUIRIES WELCOME

PRINTRONIX MVP

THE ONE PRINTER SOLUTION FOR ALL MICROCOMPUTERS AND MICROSYSTEMS

UNIVERSAL MICROPERIPHERALS LTD.

233 London Road, Croydon, Surrey. Tel:01-683-0060

LONDON COMPUTER CENTRE

NEC ADVANCED PERSONAL COMPUTER

16 bit 8086 128K Ram
2.4Mb Disk Storage
CP/M86 – MS DOS
Green Screen **£1985**
Colour Display **£2595**

SIRIUS 1

1.2 Mb Disk Storage **£2195**
2.4 Mb Disk Storage **£2695**
10. Mb Disk Storage **£3995**
apricot 256K from **£1495**

EPSON QX10

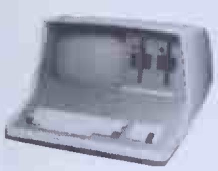
192K RAM
£1735
Upgradeable to 256K

Multi Fonts Zoom Graphics

Hard Disk for IBM PC, Sirius, QX10 NEC

10 Mb **£1545**
15 Mb **£1695**
20 Mb **£1995**
20 Mb Tape Streamer **£1495**

SUPERBRAIN 2



Dedicated Wordstar Keypad
from £1865

New TANDY Model 4

CP/M 3.0
64K-128K RAM
from £1299

TELE-VIDEO 806/816

the Multi User Computer System

PORTABLES

EPSON HX20

Portable with built-in printer
from £402

TANDY 100

Portable with built-in 4 Programmes: Word Processor, address book, scheduler, and communications. Large 40 x 8 char. line display
£433

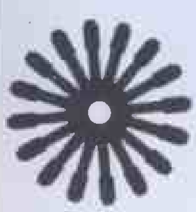
SENDATA 800 SERIES ACOUSTIC COUPLER

£220

- Compact, lightweight, portable
- 10 hours operation from the rechargable batteries
- 300 BPS answer/originate
- Handset sensor on/off switch
- New crystal controlled circuitry
- B. T. Approved.

New ZORBA

Portable
full 80 x 20 display
800K disc storage
£1595



FLOWRITER RP 1600 60 CPS

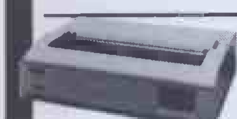
Fast and reliable
8K buffer
£1600

TEC F10 40 CPS

Diablo 620 compatible
Japanese reliability
£1350

New JUKI 6100 Daisywheel 18 CPS

Bi directional
Adler daisywheels
Diablo 630 protocols **£399**



3 in One TOSHIBA P1350

24 Needles - high speed drafts 190 CPS Letter Perfect Printing 100 CPS Addressable Pin Graphics **£1130** Options: Tractor **£87**: Sheet feeder **£520**

EPSON FX80/100 160 CPS

OKI 84 200 CPS

£850

3 TRAY AUTO SHEET FEEDER

For originals, copies and envelopes.
£695

SINGLE SHEET FEEDER £375

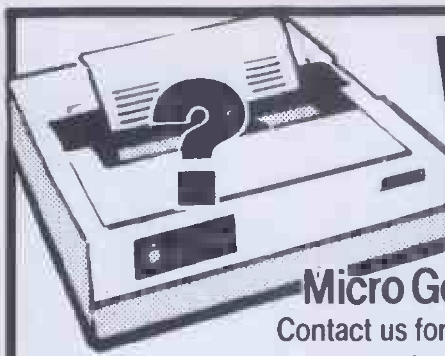
SUITABLE FOR MOST DAISY PRINTERS

New SHINWA CP 80 MATRIX PRINTER

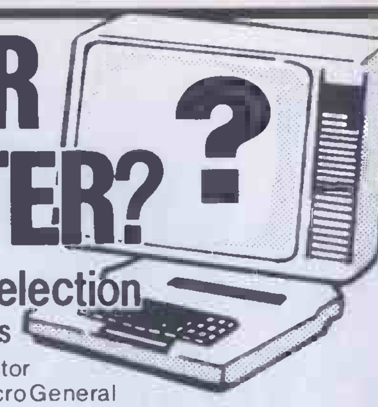
80 CPS Friction and Tractor inc. interface cable and paper **£250**

All prices are Exclusive of VAT and Delivery. Dealer Enquiries invited on all Products.
Large range of CPM Software available. Please phone for Prices.
Demonstrations on all models.

43 Grafton Way, London W1P 5LA (Opposite Maples)
Opening Hours: 10-7 Mon-Fri. 12-4 Sat.
01-387 4455 (4 lines) Telephone Answering Service After Office Hours Telex: 8953742



Which PRINTER FOR What COMPUTER?



Micro General the specialists for Printer Selection

Contact us for our expert advice on all your Interfacing problems

It's not just a question of plug in and lets go. There are now over 200 different connector situations. How do you know that your computer will accept the printer of your choice? We at Micro General do not sell boxes off the shelf. As computer engineers we help you to choose and install the right printer for your computer. The advice is free and it could save you some embarrassing mistakes – Buy from us for peace of mind.

DEALER/OEM ENQUIRIES WELCOME

MICROLINE **LOW COST** PRINTERS

FROM £226 +vat

- UP to 25% faster thru-put than nearest rival.
- Near letter quality (92/93/84).
- Ideal printer for business systems.
- High Res Graphics (92/93/84)

Microline 80	80 cps	**£226+vat**
Microline 82A	120 cps	**£329+vat**
Microline 83A	120 cps	**£529+vat**
Microline 92	160 cps	**£469+vat**
Microline 93	160 cps	**£675+vat**
Microline 84	200 cps	**£825+vat**

(M82A & M83A serial & parallel interfaces are standard)

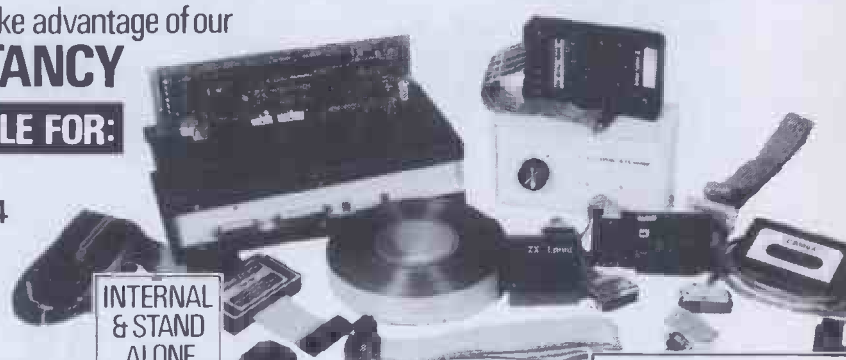
High speed serial interfaces available

TRADE or PRIVATE CUSTOMERS take advantage of our

INTERFACING CONSULTANCY

INTERFACES & CABLES AVAILABLE FOR:

VIC 20
PET
SPECTRUM
ATARI
BBC
APPLE
NEW BRAIN
ORIC
DRAGON
COMMODORE 64
TANDY
SHARP
OSBORNE
SIRIUS
SAGE
and more!



INTERNAL & STAND ALONE BUFFERS from £65+VAT

SPRINTER 32K
Buffer adaptor
£249+vat

EPSON MATRIX PRINTERS

From £279 +vat

EPSON RX80T	100 cps	**£279+VAT**
EPSON RX80F/T	100 cps	**£319+VAT**
EPSON FX80	160 cps	**£438+VAT**
EPSON MX100	100 cps	**£475+VAT**
EPSON FX100	160 cps	**£569+VAT**

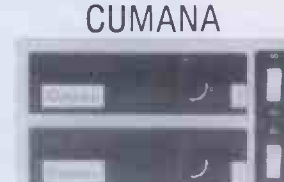
PICK OF THE DAISYWHEELS

- **Triumph Adler from £695+VAT**
- **NEC Spinwriters from £1560+VAT**
- **Brother HR15 – £540+VAT (keyboard £150+VAT)**
- **Brother HR1 – £695+VAT**
- **Silver Reed EXP550 – £650+VAT**

HERMES 612 SWISS QUALITY MATRIX PRINTER

Word processing & data printing up to 400 cps
EPSON COMPATABILITY **£1850+VAT**

CUMANA



SLIM-LINE DISK DRIVES

Prices include Cable, Format, Diskette, Power Supply and Manual.

CS100 40 track S/S – £199+VAT
CD400S 40/80 track S/S – £475+VAT
CD800S 40/80 track D/S – £599+VAT
DFS – £85+VAT
CUMANA FLOPPY DISK MANUAL (POST FREE) – £9.00 NO VAT

Micro General

Always call for the best possible price Access/Visa

(PCW 11) 6 The Birchwoods, Tilehurst, Reading, RG3 5UH Tel: 0734 25226

To match digital systems from the plethora of sophisticated equipment now available, to your particular problem is not an easy task

what is the answer?

digital solutions will first analyse your problem then select the most suitable system to solve that problem bearing in mind future developments in your business and the ongoing changes in computer technology

***FOR THE FIRST TIME** we offer you the flexibility of leasing on the following systems*

FORTUNE

from £18.66 per week

SIRIUS

from £10.62 per week

SAGE

from £14.15 per week

Prices exclusive only of VAT

PERIPHERALS

EPSON FX-80 £365
EPSON FX-100 £485
JUKI 6100 £375

SOFTWARE

PULSAR
OMICRON
BOS

FREE!

All Cables
Delivery Overnight
Full Years Warranty
Installation Advice

SPECIALS

IBM PC from £13.60 per week
CANON PHOTOCOPIERS from £2.85 per week

3 months deferred payments available

We offer a multitude of other Systems and Peripherals that will exactly fit your Management Mood!

call or write for a quote today!

digital **solutions**

digital solutions limited
Open 9-5.30 Mon-Friday
THE COACH HOUSE
THE BROADWAY
ST. IVES CAMBRIDGESHIRE
Tel: HUNTINGDON (0480) 300728

PCW/11/83

B.B.C. COMPATIBLE FLOPPY DISC SYSTEM AND DRIVES.

LOOK SUPER LOW PRICE

- CASE to hold two drives (complete with blanking panel for use should only one drive be installed).
- Ribbon cable to connect **two** drives to B.B.C. Micro.
- Integral power supply for **two** drives.
- Switch on rear of case to select 40 or 80 TPI operation when using FD55E or FD55F.

£50

THIS CASE CONTAINS ALL HARDWARE NECESSARY FOR TWO DRIVES. JUST SELECT ONE OR TWO DRIVES FROM THOSE SHOWN BELOW. IF YOU SELECT JUST ONE NOW, THE SECOND CAN JUST PLUG IN LATER.

TEAC. FD55 SERIES 5.25" ½ HEIGHT SLIM-LINE DISC DRIVES.

	Capacity 40TPI	80TPI	
FD55A 40 Track. Single Sided.	100K	N/A	£130
FD55B 40 Track. Double Sided.	200K	N/A	£180
FD55E 40 or 80 Track. Single Sided.	100K	200K	£155
FD55F 40 to 80 Track. Double Sided.	200K	400K	£218

DELIVERY: From stock, up to 4 weeks.
WARRANTY: 90 days. **TERMS**: Strictly cheque with order.
QUANTITY DISCOUNTS: 25 + **TO ORDER**: ADD CARRIAGE/PACKING/INSURANCE AT £10. THEN VAT AT 15% TO TOTAL: THE ABOVE PRICES ARE VALID UNTIL END OF DECEMBER 1983.

DIGITAL PERIPHERALS LTD.
P.O. Box 11, Stroud, Glos. U.K. GL5 1JN Tel. (045 36) 77505/71387 Telex 43551

CP/M 3 Now Available

CP/M Plus working with banked memory and virtual disk.
Much faster with many more features than CP/M 2.2.
Price includes MAC, the DRI assembler.
Available for the MAP 80, Nascom and Gemini computers using VFC or IVC & MAPRAM.

Price £257

Also Available

"MAPCOM" — a new 80 Bus computer —

- Uses a Z80 CPU
- 64K RAM expandable to 1 Mbyte
- Twin TEAC half height 5" drives
- 80 col by 25 line display
- Green screen monitor built in
- 91 key software programable keyboard
- Winchester option available
- Runs under CP/M 2.2 or the new CP/M 3 operating systems
- Business and Accounts packages available

Price £1,760

All prices exclude P&P and VAT

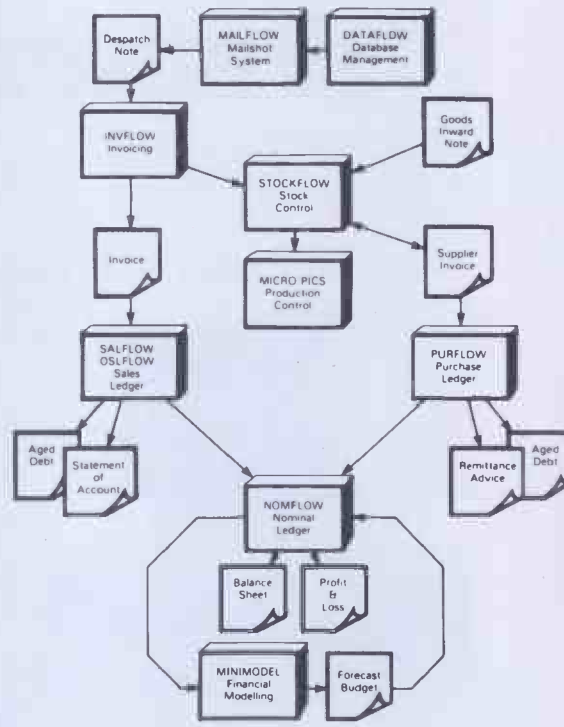
Dealer enquiries welcome

M.A.P. 80 Systems Ltd.
No. 1 Windsor St., Chertsey, Surrey
Tel: 09328 64663

AURORA SOFTWARE

for CP/M and CP/M86 Micro-computers

A Better Way to do Business



Every CP/M based micro-computer should have program packages as good as AURORA Software.

Whether you are a businessman with a micro or a dealer looking for a range of trouble-free application packages to supply with your hardware, you will find that AURORA CP/M packages are a better way to do business.

These easy to use proven packages have been developed and supported in the UK and are competitively priced.

We also supply a range of Apple II software; including IFO Database, Inter-stat statistics package, ledgers and Stock Control.

Generous terms and Dealer Kits are available to Dealers.

"SEE US AT COMPEC STAND V415 (Software village)"

GREAT NORTHERN
COMPUTER SERVICES LIMITED
16 Town Street, Horsforth, Leeds, LS18 4RJ
Tel. (0532) 589980

AS ADVERTISED ON CAPITAL RADIO!

Britain's Best Sirius Deal

The UK's biggest selling 16-bit microcomputer, the ACT Sirius 1, is now available with greatly increased storage capacity.

The Sirius plus a 10mB hard disk add-on unit, compatible in size, shape and colour, produce a complete matching Sirius system with a total disk capacity of an amazing 11.2mB.

The recommended price for the equivalent ACT Sirius 1 with integral 10mB hard disk is £3,995.*

Interam is offering the ACT Sirius 1 with compatible hard disk add-on for only £2,995.*

Even greater power: a complete system with 20mB hard disk unit is available for only £3,495!*

All Interam Sirius systems come complete with 12 months' warranty on both parts and labour.

For the best deal in the UK on Sirius computers and software contact Interam now!

**Prices exclude VAT and carriage.*

We have the IBM of small computers,

...plus winchester disk.

Mass information storage is now possible on the IBM PC.

The IBM PC is available from Interam with a fully compatible, IBM-look alike hard disk add-on. Size, shape and colour are all matched to produce a complete, enhanced IBM PC system.

Each system includes a hard disk unit (10mB or 20mB) plus dual double-sided disk drives, and comes with a full 12 months' warranty on both parts and labour.

Call us to-day for the best deal on the IBM Personal Computer with compatible hard disk expansion unit.

IBM Authorised Dealer

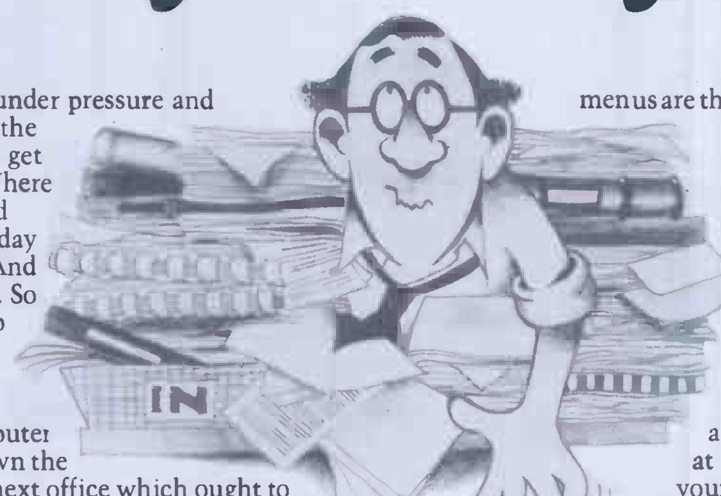
IBM Personal Computer

INTERAM

COMPUTER STORE

46 BALHAM HIGH ROAD, LONDON SW12 9AQ TEL:01-675 5325 TELEX:925859

"It must be done by Friday!"™



You are under pressure and you can't find the information to get the job done. Where is it? You could spend half the day looking for it. And still not find it. So you just give up and start all over again. This is crazy. There's a computer in the shop down the road or in the next office which ought to be able to help, but can't – simply because you don't know how to make it work.

At least, not until Friday! With Friday you can use that computer and forget all about programming. Friday will take care of everything. ■**FILES** ■**REPORTS** ■**DIARY** ■**MAILINGS**■ **and much more.** Whatever it is you need to know – how well sales are going, what the stock levels look like, who owes you money, how much you have in the bank, whose salary is up for review – Friday can tell you in seconds. Produce reports instantly to a standard easily good enough to impress the board.

But Friday isn't only fast and versatile. It's designed for people who have never used a computer before. Its documentation, described as a model for the software industry, includes an introduction to micro computing. Friday is completely menu driven, with lots of prompts to guide you through the job you are doing. The menus are there purely to help you – not to hold you up. You can switch from job to job – just as you always have. Only now you don't have to turn your desk upside down.

Invest half an hour with Friday and you will be amazed at the return. Just visit your Ashton-Tate dealer and he will demonstrate how to get it done by Friday.

Thank god it's Friday!™

For the name of your nearest dealer contact ASHTON-TATE distributors:

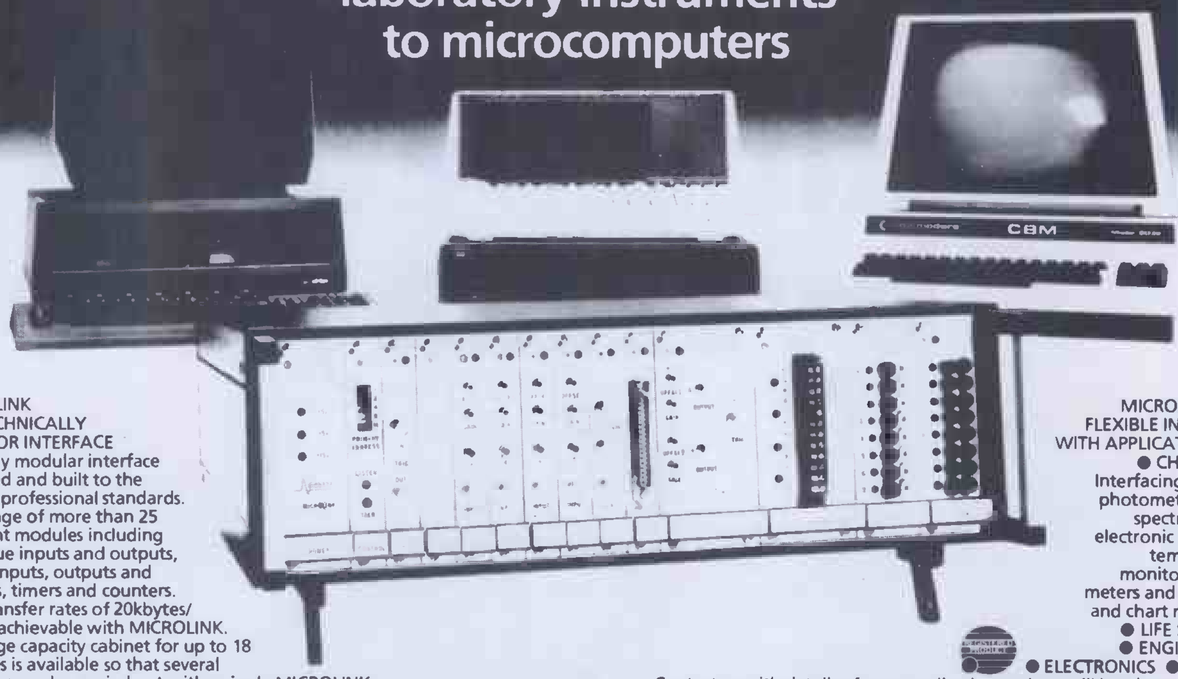
ACT (Pulsar)	021-454 8585
Arbel Ltd.	(0603) 39381
Encotel Systems	01-680 6040
Ferrari Software	01-751 5791
Midlectron	(Belper) 6811
Pete & Pam	(0706) 227011
Soft Option	(0476) 860171
Software Ltd.	01-833 1173/6
Tamsys	(Windsor) 56747
Tradesoft	01-627 1800
Xitan Systems	(0703) 334711

Supported by: Ashton-Tate (UK) Limited, Cofferidge Close, Stony Stratford, MK11 1BY.

Friday is one of the quality range of products which include dBase II, The Financial Planner and Strategist, all registered trademarks of Ashton-Tate.

ASHTON·TATE

The MICROLINK INTERFACE links a wide range of laboratory instruments to microcomputers



MICROLINK THE TECHNICALLY SUPERIOR INTERFACE

- A fully modular interface designed and built to the highest professional standards.
- A range of more than 25 different modules including analogue inputs and outputs, digital inputs, outputs and controls, timers and counters. Data transfer rates of 20kbytes/sec are achievable with MICROLINK.
- A large capacity cabinet for up to 18 modules is available so that several functions can be carried out with a single MICROLINK.
- Full software support and programming manuals for CBM, Hewlett Packard and Sirius.
- Competitive pricing – 32 analogue inputs and 8-bit analogue to digital conversion for about £750·00 and 16 thermocouple inputs and 12-bit analogue to digital conversion for under £1000·00.
- Whole systems can be supplied including the MICROLINK, computer, peripherals and software.

MICROLINK THE FLEXIBLE INTERFACE WITH APPLICATIONS IN:

- CHEMISTRY Interfacing spectrophotometers, mass spectrometers, electronic balances, temperature monitors, colorimeters and transient and chart recorders.
- LIFE SCIENCES
- ENGINEERING
- ELECTRONICS
- PHYSICS

Contact us with details of your application and we will be pleased to help. Sales literature and prices from:

Biodata Ltd.,
6 Lower Ormond Street,
Manchester M1 5QF, U.K.
Tel: 061-236 1283

Biodata

DUE TO A CHANGE OF BUSINESS WE HAVE THE FOLLOWING STOCK TO CLEAR AT PRICES THAT ARE BELOW OR AROUND DEALER COST PRICE. THE COMPUTER ROOM IS A MAJOR COMMODORE AND APPLE DEALER OF 4 YEARS' STANDING. WE HAVE MANY MORE BARGAINS TO SELL. NO SENSIBLE OFFER REFUSED!!!!

Quantity	Product APPLE	Price Each (Ex VAT)
1	Apple II E 64K	528.00
1	Apple disk drive with controller	216.00
1	Apple disk drive without controller	154.00
1	12" Green Sanyo monitor	90.00
1	Apple II 16K memory expansion kit	33.00
1	CCS serial card	74.00
1	Videx 80 column card for Apple II	145.00
1	Parallel Interface card for Apple II	75.00
1	Apple to Corvus personality card	130.00
1	Apple Writer III for Apple III	99.00
1	Access III for Apple III	67.00
2	Apple II Visidex programs	117.00
2	Apple II Visiplot programs	111.00
1	Apple II Visiterm program	55.00
1	BSTAM CP/M Downloader	50.00
21	Apple II disk drive covers	2.50
11	Apple II or IIE covers	5.00

Quantity	Product	Price Each
	COMMODORE PRODUCTS	
1	VIC20 ROM Emulator	75.00
2	VIC20 low cost serial interfaces	29.00
1	VIC20 Vicalc program	10.00
2	4022 80 column printers	290.00
3	VIC20 3K RAM expansion packs	15.00
2	VIC or 64 1540 disk drives (up to 1541)	190.00
1	OZZ database program for 8000 series	200.00
1	8250 2 Megabyte dual disk drive	672.00
2	8050 1 Megabyte dual disk drives	672.00
1	Serial interface for Commodore	90.00
2	VIC revealed books	5.00
1	Visicalc for 8000 series	105.00
1	Spectrum integrated ledger system	300.00
1	8096 96K computer	896.00
1	8032 32K computer	745.00
	PRINTERS + MISC.	
1	QUME Sprint 5 daisy wheel printer	600.00
1	Dolphin BD80P printer 80/132 column	350.00
2	Epson MX80 printers	290.00
1	Anadex 9000 printer 80/100 column	400.00
1	Microsoft Basic Compiler Superbrain	50.00
1	DMS Database System for Superbrain	199.00

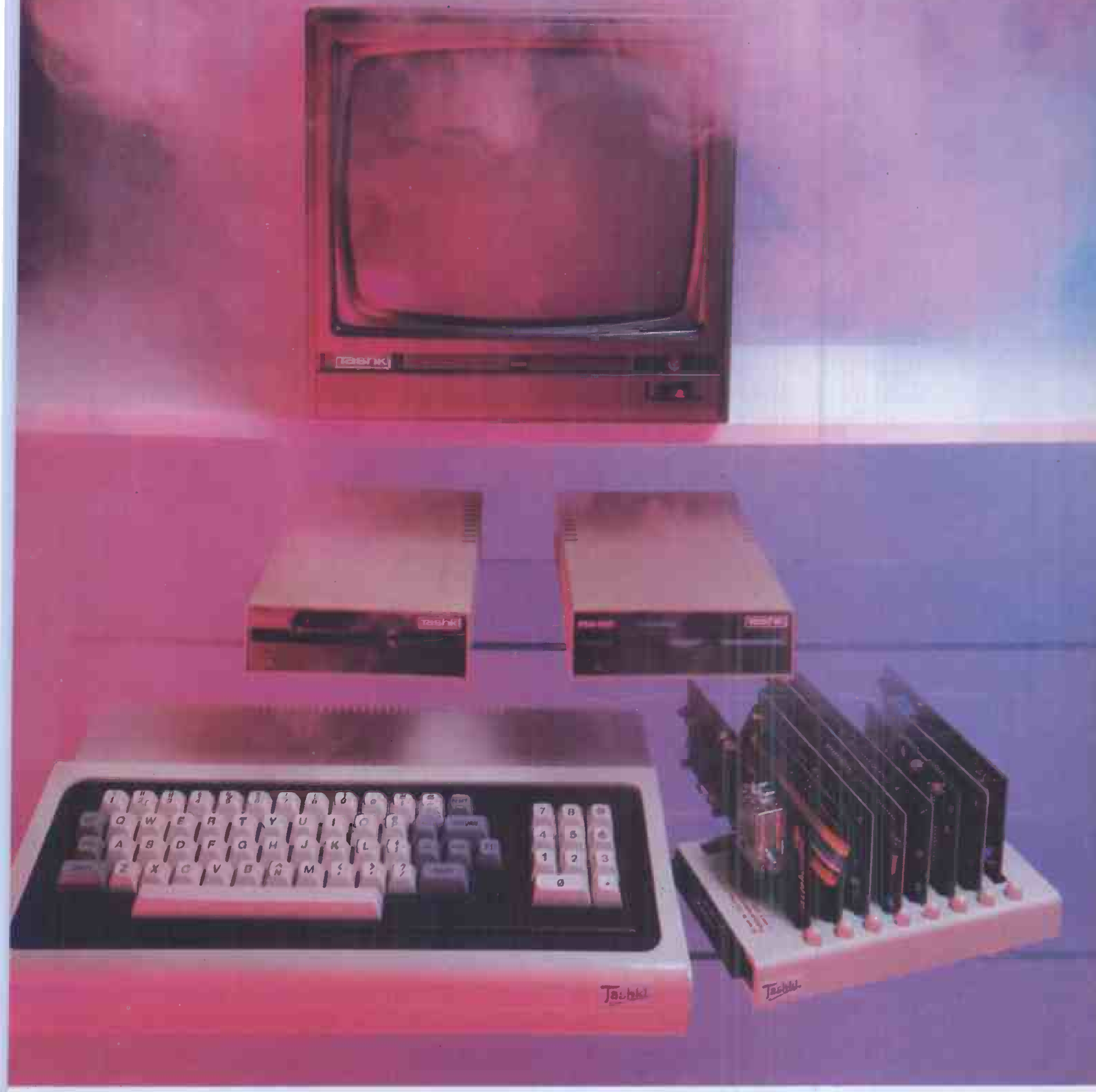
Most items are new or ex dem. Please 'phone for details. We also have a stock of paper and disks to sell at low prices. Paper £9.50 box 2000. 10*40 track Verbatim disks £15.00. Disk trays £12.00 and £18.00 for 40 and 80 disks. Many daisywheels, ribbons, etc, also at giveaway prices.

To confirm your order telephone today to Colin Stapp.

The Computer Room

87 High Street, Tonbridge, Kent TN9 1RX
Telephone (0732) 355962

evolutionize the way you think about computers.
The new OM8064



8064 packs all the power you will ever need. Sleek and trim, yet fully expandable with eight slot ansion unit.
newly designed compact keyboard is a piece of art in itself. The OM8064 features ultrasensitive key single key programming commands, you will get much more including a powerful 64K dynamic RAM up to of ROM, 24 line x 40 character text display with high resolution graphics a 6502 and Z80 microprocessor.

aler Enquiries welcome

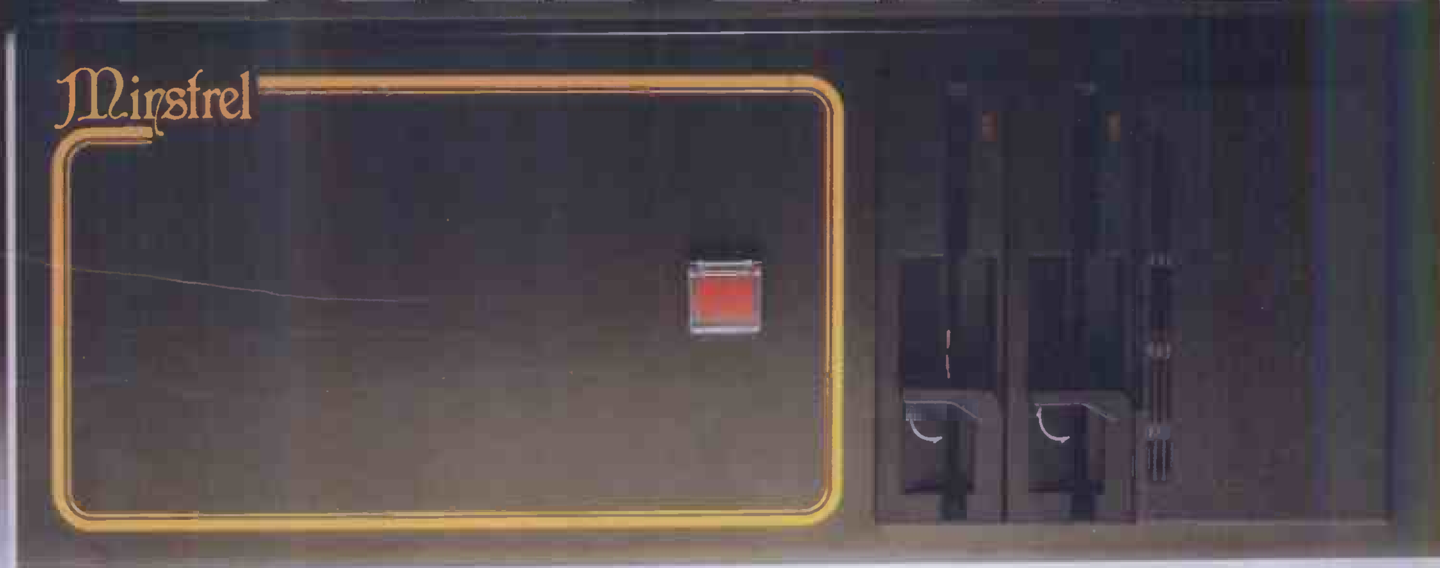
ASHKL COMPUTER SYSTEMS LTD
LOGAN ROAD, WEMBLEY, MIDDLESEX HA9 8PX
EL No. 01-904 4467. TELEX No. 296708

£1080 PLUS VAT

THE PRICE OF THE COMPLETE SYSTEM COMPRISING OF:

OM8064 MICROCOMPUTER WITH
* STANDARD 64K RAM
* 8 SLOT EXPANSION UNIT & COVER
* STANDARD 2K ROM FOR CP/M®
* MAXIMUM 14K ROM FOR BASIC
* STANDARD 6502 CPU AFG CARD
* STANDARD Z-80 CARD
* STANDARD CENTRONIC I/F CARD & I/F CABLE
* STANDARD 80 COLUMN CARD
* STANDARD FLOPPY DISK DRIVE CONTROLLER
* TWO 5¼in SSSD SLIMLINE DISK DRIVES & I/F CABLES EACH 163 KBYTES
* 12in GREEN MONITOR & CABLE
* JOYSTICK ADAPTOR CABLE
* TV ADAPTOR
* TAPE RECORDER CABLES

PICK OUR BRAINS.



The brain of a good computer system is the bit you never see. But that's precisely the bit that decides whether you've bought a Saville Row suit that fits your business like a glove – or a one size strait-jacket.

So if you're tempted to grab that nationally advertised neatly packaged "system" – just stop and think that while it's designed for everyone in general, it certainly wasn't designed for you in particular.

Instead, how about investing in some top, no-axe-to-grind, professional advice. And if you fill in the coupon, we'll send you a list of dealers and consultants covering your locality.

That way you'll get exactly the brain you need, and the precise add-ons and peripherals to match. Fitting your present needs and your future prospects.

And if you end up with a MINSTREL computer as the "brains" of your system – no surprise. Because we've designed it to mix, adapt and grow with the widest range of other equipment, freeing you to choose the set-up that suits you perfectly.

The fact that it's British-made*, ruggedly constructed and keenly priced are hardly drawbacks either.

And if it isn't right for you – you'll be told so. Because, as you may have gathered we believe the system should suit the customer – not vice versa.

*The MINSTREL is made exclusively for HMS by High Technology Electronics in Southampton.

Please send me details of the Minstrel Computer and your list of recommended dealers and consultants in my area ☐
I'm a buff. Please send me full specification of the Minstrel, and prove it's as good as you say ☐

Name ____________________

Company ____________________

Address ____________________

____

____

H M Systems

HMS LTD. 69 LOUDOUN RD LONDON NW8 0DQ TEL: 01-328 8737/8

JUST IN CASE YOU ARE A BUFF OR BOFFIN WE'LL JUST MENTION OUR S100 BUS, Z80 AND 64K BYTE BASIC SYSTEM, OPTIONAL Z80 SLAVE PROCESSOR CARDS, UNLIMITED EXPANSION MEMORY, ALTERNATIVE 68000 OR 8086 PROCESSORS, CP/M TURBODOS OR MINOS MULTIUSER OPERATING SYSTEM, HORIZON COMPATIBILITY, 5, 40, 20 OR EVEN 40 M BYTE WINCHESTER HARD DISC ETC. ETC.

NO LIMIT

Now, a home computer with virtually no limit to its possibilities. The astonishing new Sharp MZ700. A machine with a dazzling array of talents.

First, it's a 'clean' machine. So you are not limited to any one computer language. You have the flexibility to run and write programs in BASIC, FORTRAN, MACHINE CODE, PASCAL, ASSEMBLER and many others. And the MZ700's 512 predefined characters mean you can build up detailed pictures on the screen, without spending time specifying and designing special characters for games and special effects.

Second, it has a memory of 64K. So as your technique improves and develops, you are able to move forward to more and more advanced programming.

All of which makes this the perfect home computer for parents, as well as children.

The MZ700 gives you access to a wide choice of new software, from only £3·95 per cassette. An additional plotter/printer, costing £129·95, can produce high resolution graphics in 4 colours. A data cassette recorder is an extra at £39·95. Both add-ons fit snugly into this easy to carry compact system with no trailing wires. And you get ten exciting games, free on purchase, including Super Puckman, Circus Star, Snake v. Snake, and Man-Hunt.

The brilliant new MZ700.
The no-limit computer. £249·95. From Sharp. Where great ideas come to life.

PU:	Z80A	1
OM:	Monitor 4K byte ROM	1
	Character generator 4K byte ROM	1
AM:	64K byte D-RAM	8
	4K byte V-RAM	2
/O bus:	Expansion 1/0 bus	1
	Additional printer 1/0 bus	1
	Cassette READ/WRITE terminals	2
	Joystick terminals	2
GB MONITOR/VIDEO MONITOR/RF OUTPUTS		

COMPATIBLE WITH SHARP MZ 700 SERIES

Look for this logo on software denoting Sharp Compatible Software.

To: Sharp Electronics (UK) Ltd,
Home Computer Division,
Sharp House, Thorp Road, Newton Heath,
Manchester M10 9BE. Tel: 061-205 2333

Please send me details of the Sharp MZ700.

Name ______________________

Address ______________________

____

PCW1

The world of
SHARP
where great ideas come to life.

et's Face It, the price of some Professional Computers is just plain ludicrous

There's one crucial drawback in deciding to go for an advanced professional Computer. The price.

As soon as you leave behind those that are essentially video game machines, few micros designed for the serious user have a homely kind of price.

Except the Toshiba T300.

We have no difficulty at all in convincing professional, executive and academic users of its value as a computing device, particularly when they learn that the printer can print both draft and letter quality at 192 and 100 c.p.s. respectively.

It has a 16 bit 8088 CPU, 192-512 KB RAM and up to 512 KB Video RAM, together with 5¼" floppy disks giving another 1·2 M byte and an optional 10 M byte internal Winchester disk.

Enough to ensure, through its MSDOS® & CP/M 86® operating systems access to high level languages like PASCAL, COBOL and FORTRAN as well as BASIC.

Because the T300 is also IBM software compatible, software choices are as flexible as any individual user could wish. Perhaps most relevant, however, is its highly competitive price, a price that eliminates at a stroke, a large number of likely contenders, assuming they could match Toshiba's T300 for performance and reliability.

Add to this 12 month's Warranty, nationwide service and minor details such as full colour graphics, sleek styling and the trust that goes with a Toshiba name- plate and we think you'll agree that, as the proud owner of a T300, the prices others are paying for their Professional Computer will give you some cause for merriment.

Sole UK Toshiba Distributor

SCAN

SCAN COMPUTERS LTD
Chanctonbury House, Church Street, Storrington
West Sussex RH20 4LZ Tel: (09066) 5432

SHORT SPECIFICATION T300

CPU:
8088 (16 bit)
STORE:
192-512 KB RAM up to 512 KB Video RAM
DISPLAY:
80 characters × 25 lines, 640 × 500 Dot Graphics, 256 colours
MASS STORAGE:
2 × 5¼" floppy disks each with 640 KB, Internal 10 M Byte Winchester Disk
INTERFACE:
Centronic Parallel RS. 232 V.24 I-EEE 488.
DIMENSIONS:
16.5" × 3.9" × 10" (suitable for audio rack system)
OPERATING SYSTEMS:
CP/M 86® MSDOS®
LANGUAGE OPTIONS:
BASIC, FORTRAN, COBOL, PASCAL.

have the last laugh with the Toshiba T300

The price of some computers makes me cry.
Please send me full details of the Toshiba T300.

Name:

Address:

Telephone:

TOSHIBA


The new Argus
Above all, a true
FERRANTI PPC
ARGUS

Pro-personal. 6-bit computer.

On performance alone, the new Argus Pro-personal computer is way above the rest.

It's a true 8086-based 16-bit machine. And it's fast – 8MHz.

Our Argus Pro-personal also gives you a choice of backing store from floppy right up to big Winchesters, and memory up to 896K.

So you've got the capacity and speed for professional-sized programs, and that means savings in expensive professional time.

A NEW WORLD OF SOFTWARE

Running industry-standard CP/M-86†, the Argus Pro-personal opens your door wide to a vast array of 16-bit application software.

Ferranti also supplies software packages for major applications such as word processing and spreadsheet calculations. Of course the Argus Pro-personal can also run your existing 8-bit software.

It adds up to all the power and capacity you need. Benchmark tests have proved it outperforms its competitors.

A COMPLETE PACKAGE PUTS YOU ONE UP

Right from the start the Argus Pro-personal gives you what you want. CP/M-86† and BASIC are included. So is 128K of memory – and it's all available to you because the VDU has its own memory for both alphanumerics and high resolution graphics.

Check this out against the competition.

A COMPUTER WITH THE HUMAN TOUCH

For all its professionalism, the Argus Pro-personal computer is easy to live with. It's user-friendly in every way. Compact and good looking, with clear characters on an anti-reflective screen. The VDU tilts and swivels, and the keyboard, VDU and processor box can be placed to suit the operator.

CP/M-86† is menu-driven so it's easier to use.

IF YOU'RE LAUNCHING AN AUTOMATED OFFICE

The Argus Pro-personal with the rest of the Ferranti office product range allows access to mainframe computers, so if you want it to be part of a general office automation scheme, there's no problem.

YOU'RE ON FIRM GROUND WITH FERRANTI

Behind the Argus Pro-personal computer, a product at the leading edge of a fast moving technology, is a company with over 20 years in the computer business.

Ferranti has an unsurpassed reputation for quality assurance and reliability.

So, your investment is protected for the longest possible time. And you get a first-class maintenance service to back it up.

For a high-flying computer the Argus Pro-personal price tag is remarkably low level.

It starts at just £2,800.

Ferranti Computer Systems Limited,
Simonsway, Wythenshawe,
Manchester M22 5LA.
Telephone: 061-499 3355, Telex: 668084

FERRANTI
Computer Systems

†CP/M-86 is a trademark of Digital Research Inc.

Please show me how the Ferranti Argus Pro-personal computer can serve my computing needs.

Name____________________

Position____________________

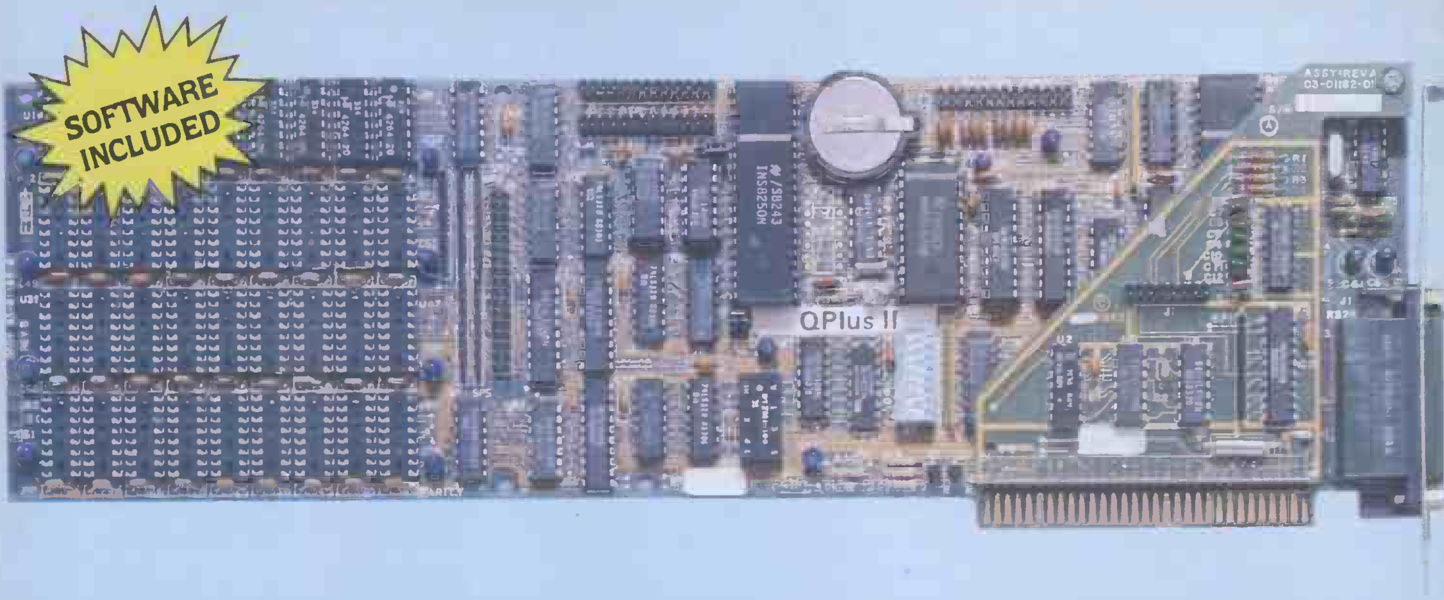
Company____________________

Address____________________

Telephone__________ Telex__________

Ferranti Computer Systems Limited,
Simonsway, Wythenshawe
Manchester M22 5LA.

ARGUS
PRO-PERSONAL COMPUTER



QPlus II: The Ultimate Expansion for IBM PC or XT

This really is the only board you need to expand your IBM PC or XT. QPlus II has the features you need on a board that is cost effective, versatile, and reliable. In fact it's the best selling expansion board in America, the birthplace of the PC. You can start out with the basics as standard equipment, and can add features as the need arises. Or you can get it all right now -in one slot.

THE BASICS

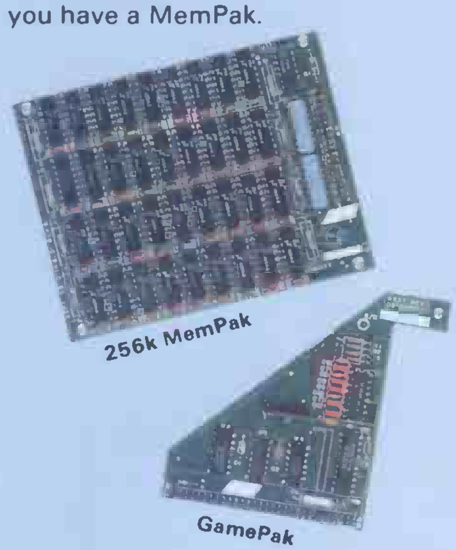
QPlus II has three functions standard: Parity checked and fully socketed memory up to 256k in 64k increments, battery powered clock/calendar, asynchronous communication port (RS232C serial) which can be used as COM 1 or COM2, (DTE for a printer, DCE for a modem). Also included are: SuperDrive™ disk emulation and SuperSpooler™ printer buffer software. Optional is a 100% IBM compatible parallel printer port, and a second async port for another £35 each. You can also plug an additional 256k of memory by adding the 256k MemPak. Or choose a game port by adding the GamePak.

CLOCK/CALENDAR

Our clock is powered by a simple lithium battery. It is clipped on, not soldered like some other clock boards. We send you a diskette with a programme that sets the time and date when you turn on your computer. Now all your programmes will be saved with the correct time and date on them without you having to think about it.

THE QUBIE' PAKS

The pictures show the optional 256k MemPak™, and the new GamePak. These boards mount "piggyback" on the QPlus II. The 256k MemPak gives the PC's the ability to add 512k of memory in one slot. Now you can create disk drives in memory up to 360k, set aside plenty of space for print spooling, and still have adequate memory for your biggest programmes. The GamePak option uses any IBM compatible joysticks or paddles. It plugs onto the pin set just above the edge connector so you can add one even if you have a MemPak.



CREATE "ELECTRONIC DISK DRIVES"

Included with your QPlus II is a piece of software that is revolutionizing the microcomputer world - SuperDrive™. It uses a portion of memory which you designate to create up to three "disk drives". These "electronic disks" can be used just like a physical drive with one big advantage -they access your programmes at the speed of RAM memory. Any operation requiring use of the disk drive can be done in fractions of the time normal disk drives take. Wear and tear on your drives and diskettes are greatly reduced. And you can use it with 1.1 or 2.0 versions of PC DOS.

OPERATES YOUR PRINTER

You also get SuperSpooler™ software, which uses a portion of your memory to work as a print spooler. No longer will you have to wait for your printer t finish printing before you can begi working with your computer. The po tion of memory you designate wi accept data to be printed as fast as th computer can send it and frees you computer for more productive work. is compatible with 1.1 and 2.0 version of PC DOS, and can be used wit serial or parallel printers.

WHY BUY A QPlus II?

Quality and Serivce. QPlus II is man ufactured by the leading supplier c enhancements for the IBM PC. A Qubie' we provide the service an support most companies just tal about. We realize how integral thi board is to the use of your computer What good is a warranty if it take weeks for repairs to be made? W offer 48 hour turnaround or a replace ment board on all warranty repairs We also offer a one year parts an labour warranty. An additional on year extended warranty is £35.

AVAILABLE AT COMPUTER DEALERS EVERYWHERE

PRICES:

QPlus II™ with memory, clock, seria port, and software:

64k £289 128k £359 192k £429
256k £499

OPTIONS:

Parallel Printer Port	£35
Second Asynchronous Port	£35
GamePak	£35
MemPak™ with 256k Memory	£349

QUBIE' DISTRIBUTING LTD.

Tempo House, 15 Falcon Road
London SW11 **(01) 223-7662**
(01) 223-4569 **(01) 870-8899**

apric

The 4th generation personal computer

A computer that, for the first time, works with you rather than just for you. Hardware and Software co-ordinating perfectly, Apricot arrives complete and ready to work.

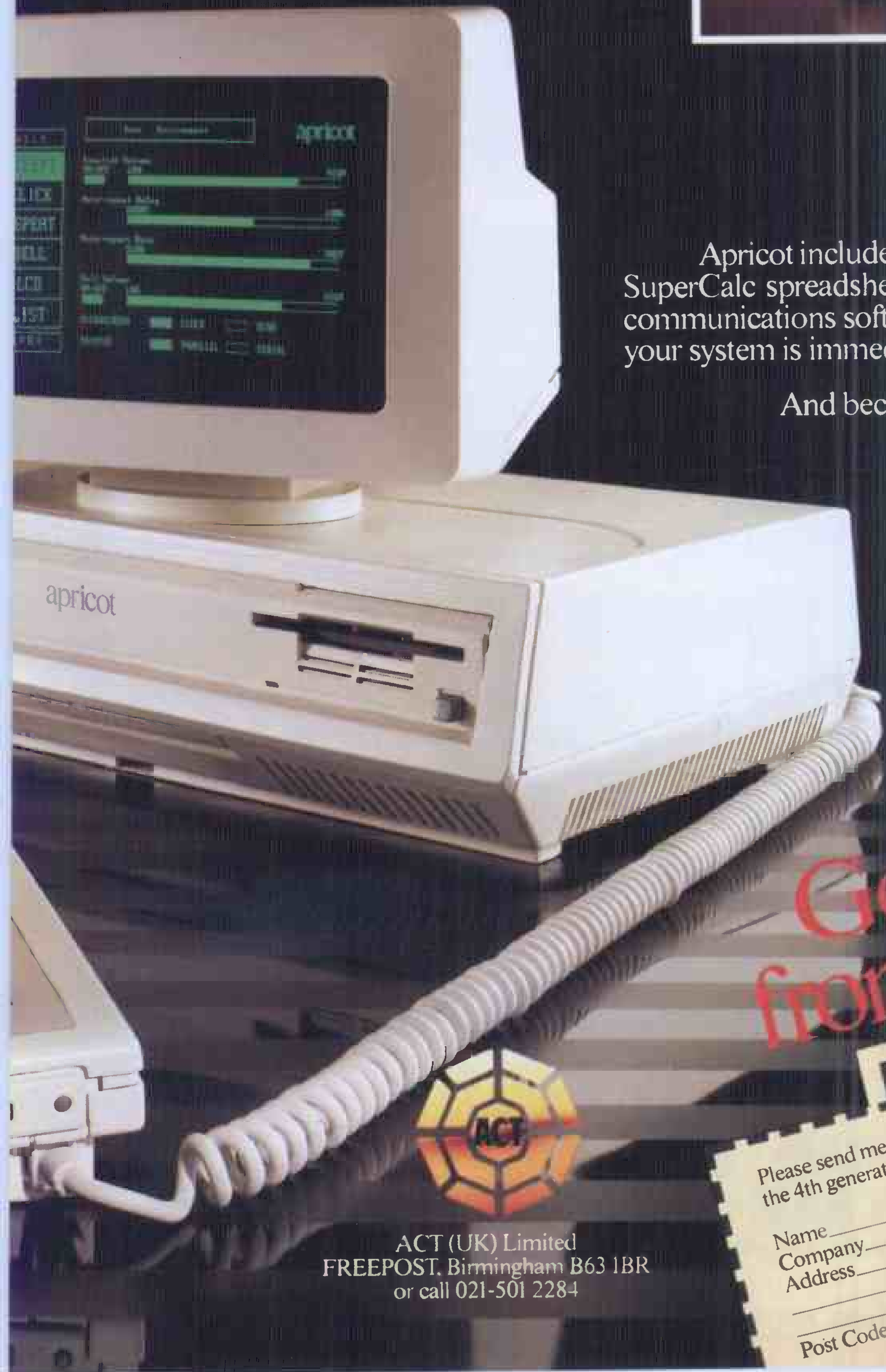
The MicroScreen™ on the keyboard, unique to Apricot, performs a variety of practical functions—as a calculator, calendar, time display, and as a window on the screen. Most significantly the MicroScreen™ prompts and assists the user by presenting simple options whilst running applications.

Incorporating the very latest advances in computer technology, Apricot uses 3½" pocket-size diskettes. Secure and compact, yet offering increased storage capacity.

As you'd expect with a 4th generation system, Apricot offers true 16-bit processing, multi-processor architecture and 256k RAM as standard.

With Pulsar 16-bit business software and compatibility with the best selling ACT Sirius 1 and IBM PC, Apricot already has the largest available software library.

ot



Apricot includes over £750 of software—SuperCalc spreadsheet, business and communications software—to ensure that your system is immediately effective.

And because executives are not office bound, Apricot offers portability, a further feature aimed at improving efficiency.

Powerful sleek and sophisticated—and all at an amazing 4th generation price.

Go 4th from £1495

ACT

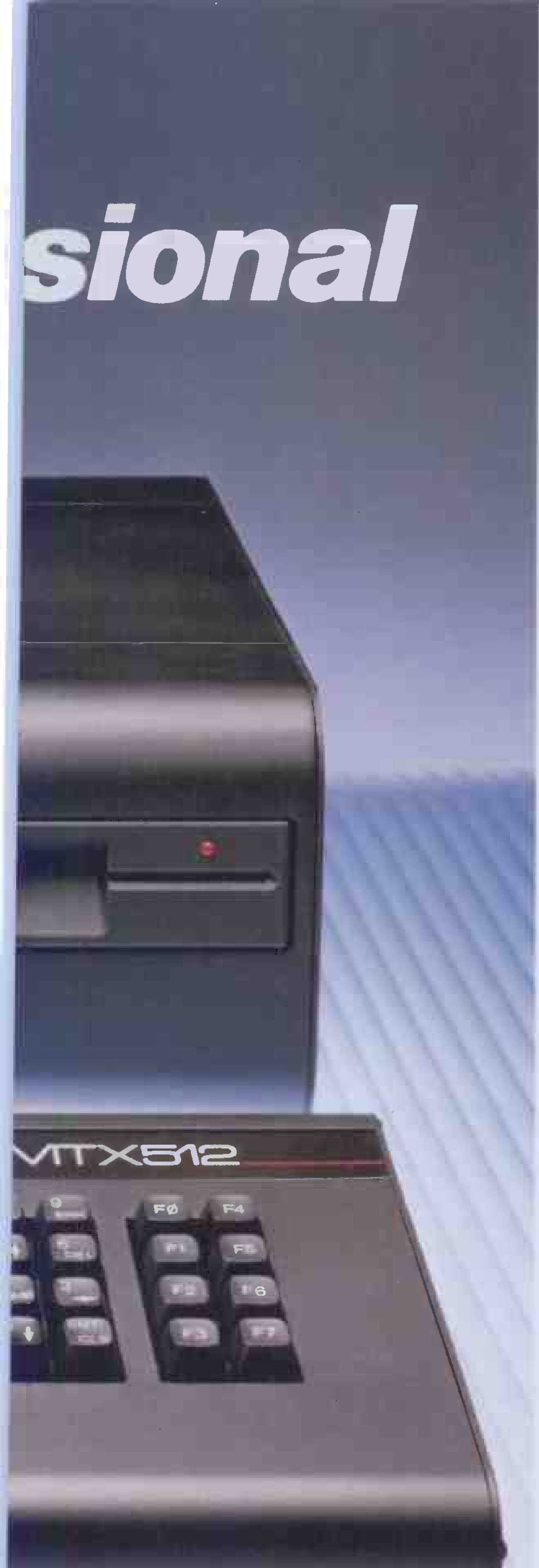
ACT (UK) Limited
FREEPOST, Birmingham B63 1BR
or call 021-501 2284

Please send me the latest information on Apricot—the 4th generation personal computer.

Name ______
Company ______
Address ______

Post Code ______

PCW OCT



The All-Purpose System

The MTX Series is a new departure in micro-computer technology. Whether your needs as a user are for personal programming, games playing, scientific or process control, educational or business use the MTX Series is already capable or very easily adaptable to almost every application. Glance through the standard features below - you'll see what we mean.

Hardware - 32K RAM on the MTX500, 64K on the MTX512.

The MTX500 has 32K of user RAM as standard (64K on the 512), expandable to 512K plus 16K of video RAM, controlled by a separate Video Processor. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and 32 easily moveable user defined graphics characters (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 4 channel sound with hifi output plus a dedicated cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight 2-function keys and separate numeric pad.

Software

The MTX's 24K ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, MTX LOGO commands, NODDY. ROM routines include an ASSSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program,which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to split the screen into a maximum of eight sections to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

The Disc Based Computers from Memotech

Designed to use the full power of the MTX computers the FDX and HDX make perfect business systems at prices which make perfect business sense. Both feature the CP/M operating system, giving instant access to a wide range of proven application software. Available in October these feature:

- *Full Western Digital floppy disc controller set with SASI interface for 4 drives, CP/M types 0-13.*
- *minimal latency, very high data transfer rates*
- *optional Colour 80 Column Board*
- *optional Silicon Discs (1/4 Mb) which dramatically increase the efficiency of 8 bit software to those of 16/32 bit software; increases life and reliability of mechanical drive*
- *permits single disc CP/M operation*

FDX— Floppy Disc System

1 or 2 5 1/4" Qume drives 500K unformatted, 347K formatted,

HDX—Hard Disc System

5 1/4" Qume drive, 500K unformatted, 347K formatted,
5 1/4" Winchester which may be 5, 10, or 20 Mb

All Memotech products are designed and manufactured in Oxfordshire, England

MEMOTECH
MTX
SERIES

A PERFORMANCE AND PRICE BREAKTHROUGH IN APPLE II® & IIe HARD DISC STORAGE

High Performance AID hard disc systems of 5-20 megabyte capacities, specifically designed for use with the Apple, are now available running under DOS, CP/M & Pascal. The units cold boot and throughput speeds are really impressive. If you want to leave others standing, try our fast DOS option!

The range features the 5+5 and 10+10 drives which enable you to configure half the drive as primary and half as secondary storage for ease of archiving.

The systems have been designed around the concepts of data reliability and convenience of operation.

They are simply the most competitive hard discs on the market. So why pay more for less.

interface INTEC technology

INTEC, 191 Clarence Gate Gardens, Glentworth Street, London NW1 6AR. 01-723 6305. Tlx: 8813271 GECOMS G

AID

LOW PRICE

5 Mb	£990
10 Mb	£1270
20 Mb	£1490

All prices ex-VAT.
Apple is the registered trade mark of Apple Inc.

DEALER ENQUIRIES WELCOME

Expansion for Genies and TRS 80

DIRECT FROM THE MANUFACTURER — **NO EXPANSION INTERFACE REQUIRED**

TRS80 AND VIDEO GENIE

64K RAM

This allows a full 48K Ram for Basic plus an additional 16K Ram for machine code overlay. This area can be used as a Ramdisk, printer spooler, storage space for spreadsheet or database programs, or just an extra large adventure.
In a second mode it allows for 12K of Ram within the bottom 16K block to allow modification of the Basic interpreter.
Supplied complete with small machine code driver.

64K Ram	£52.50
48K Ram (only)	£43.50

DISK DRIVE THAT PLUGS DIRECTLY INTO THE KEYBOARD

£230

The DP2000 combines a Canon disk drive with disk controller, parallel printer interface and power supply in a sleek but sturdy steel case. All you need is your computer and a disk operating system. (We even supply a 13amp plug!) Extra drives can be connected.

PARALLEL PRINTER INTERFACE WITH DISK CONTROLLER

£86

The DP1000 plugs directly to the keyboard. Just plug in your computer to one side and your disk drive and printer to the other side and off you go! Comes complete with P.S.U. in a sleek but sturdy steel case.

COLOUR GENIE OWNERS

NEW! NEW!

Connect a disk drive for £99 only with the WIZARD interface

THE WIZARD

The Wizard is an interface which connects direct to the cartridge port on the Colour Genie keyboard. The Wizard comprises a disk controller, with 25ms interrupt driven heartbeat output to provide a real time clock, Centronics parallel interface and power supply, enclosed in a sleek, sturdy, steel case. It even has a mains plug with the correct fuse already attached.
The Wizard was designed and is manufactured by us in our own factory. The design utilises the experience we have gained over the last two years in designing and manufacturing a similar interface for the Video Genie and TRS 80 Model I computers.
Further disk drives can be added using a standard daisy chain cable.
The printer interface can be used whether or not a disk drive is connected.

WIZARD £99

QDOS

QDOS is the disk operating system for the Colour Genie with Wizard interface.
QDOS facilities include: Append, Attrib, Auto, Backup, Basic, Clock, Copy, Date, Dir, Dump, Format, Free, Kill, Lib, List, Load, Print, Prot, Rename, Time, Verify, Trace.
QDOS is also specifically designed to Read and Write files set up by most disk operating systems for the Video Genie and TRS-80 Model I computers. You can therefore transfer your files and maintain compatibility.
QDOS also includes an extended colour Basic with over 30 additional commands.

QDOS £35

★ SPECIAL INTRODUCTORY OFFER ★

Buy the Wizard Interface and a disk drive from us and get QDOS FREE.
For example:

Wizard	£99
Canon 110 Drive	£169
Ribbon cable	£19
TOTAL	£287

(WITH FREE QDOS)

DISK DRIVES FOR TRS 80, GENIES, BBC, DRAGON, ETC.

CANON slim Disk Drives

	Bare Drive	With case & P.S.U.
110 40 track single sided	£139	£179
210 40 track double sided	£179	£209
220 80 track double sided	£229	£269

TEAC

	Single	Dual
40 Track	£185	£330
80 Track	£245	£399
80 Track double sided	£359	£675

Ribbon cable £19

PRINTERS

EACA EG3085 (120cps dot matrix)	£357
EG603 (Genie microprinter)	£200
Brother HR1 (low cost, reliable daisywheel)	£630

COMPUTERS

Genie I	£287.00
Genie II with numeric keypad	£260.00
Genie I with 48K internal RAM	£318.00
Genie II with 48K internal RAM	£297.00
Colour Genie 32K	£146.00
Oric	£147.78
Dragon 32	£152.18
Sinclair Spectrum 48K	£113.00
Spectrum 16K	£86.91
Sinclair ZX81	£43.43

Gnomic

All prices exclusive of VAT and Carriage

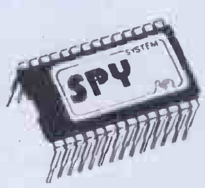
GENERAL NORTHERN MICROCOMPUTERS LTD.

Dept. PCW1183, 8 Whitworth Road, South West Industrial Estate, Peterlee, Co. Durham SR8 2JJ.
Telephone: Peterlee (0783) 860314 (24 hour Answering Service)

Credit Facilities Available

Available now from . . . SYSTEM SOFTWARE

A comprehensive debugging monitor and dis-assembler on ROM for the BBC microcomputer.



SPY is instantly accessible to the programmer for inspecting, modifying, debugging and dis-assembling machine code programs. SPY has a very comprehensive set of commands supported by an excellent Users Guide.

SPY features
- great, easy-to-read COLOUR display
- single key commands
- hexadecimal, ASCII and DIS-ASSEMBLED display modes
- SINGLE STEP and TRACE in hexadecimal and DIS-ASSEMBLED instruction modes
- access front panel with BREAKPOINTS, OSBYTE (new *FX call added) or CTRL-F. All entry points can be enabled or disabled
- continue program execution with CONTINUE and JUMP commands
- NUMEROUS commands for locating memory including FIND byte pattern and FIND "string"
- alter memory and registers with ease
- includes FILL, MOVE, VERIFY and TYPE memory commands
- instant SPY GUIDE help page
- can inspect and repair BASIC programs with or without ASSEMBLY LANGUAGE routines
- *LST added to operating system commands to DIS-ASSEMBLE memory to screen or printer
- ROM-based program can NOT be corrupted. Shares workspace amicably with BASIC. Uses NO USER RAM.

This is the **ULTIMATE** debugging aid for the serious programmer.

£24.15 incl. vat

music editor

Write your own compositions for the BBC microcomputer or enter tunes directly from sheet music with ease.

- full GRAPHIC display showing treble and bass staves
- VERSATILE SCREEN EDITOR with single key input
- up to 1200 note compositions on tape (600 on disc)
- SAVE your music/sound effects on disc or tape
- write in ANY KEY; sharps and flats are put in automatically
- up to 3 VOICES
- redefine up to 16 ENVELOPES
- graphically FOLLOW the amplitude/envelope, duration and pitch of each note
- HEAR the notes as you enter them

32K required disc or tape **£9.00 incl. VAT**

Super new GRAPHICAL ENVELOPE GENERATOR

- interfaces directly with MUSIC EDITOR
- 16 special envelopes already defined
- SAVE envelopes for use in ANY program
- easy to use SCREEN EDITOR
- amplitude and frequency parameters are displayed GRAPHICALLY

32K required disc or tape **£7.00 incl. VAT**

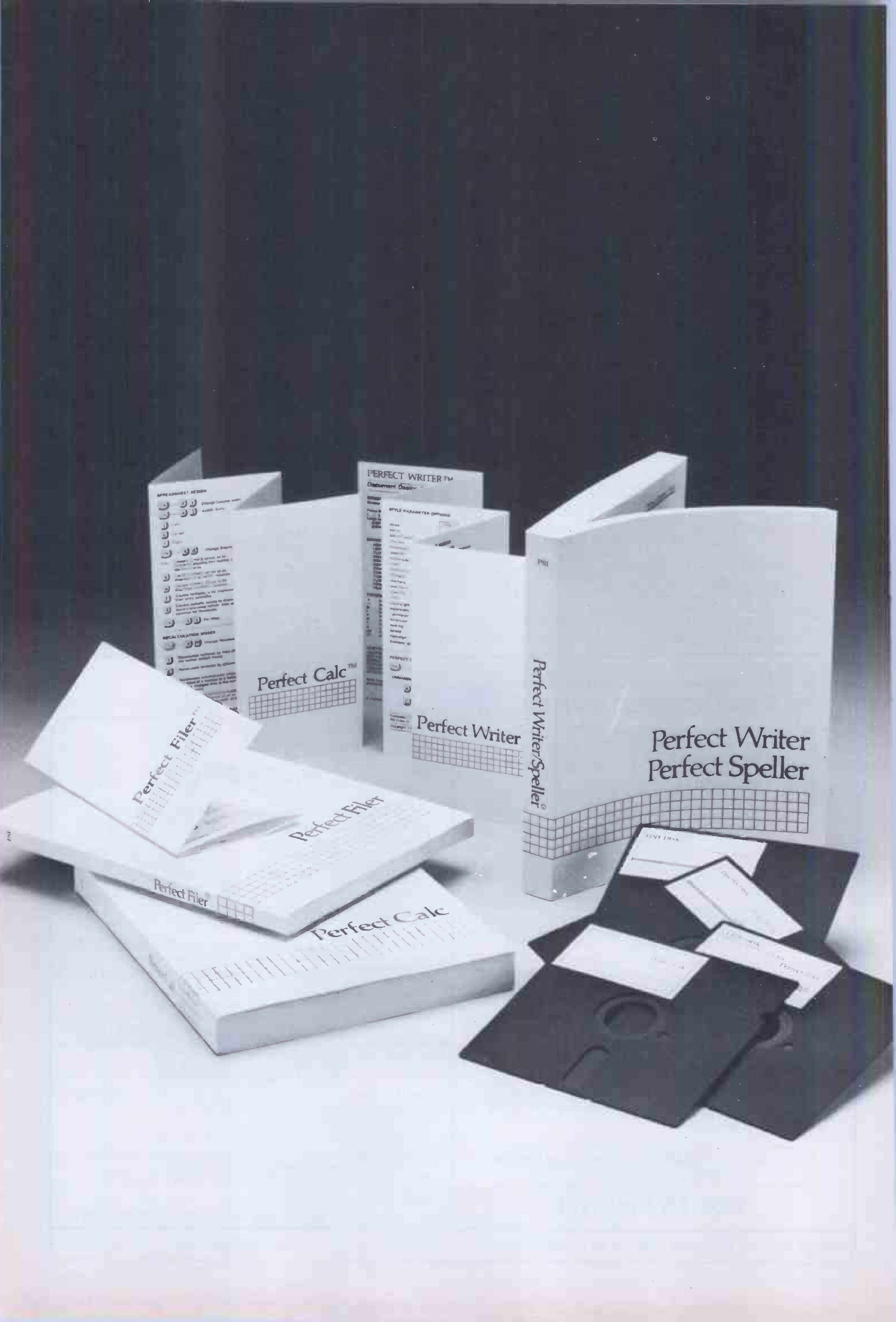
CHARD

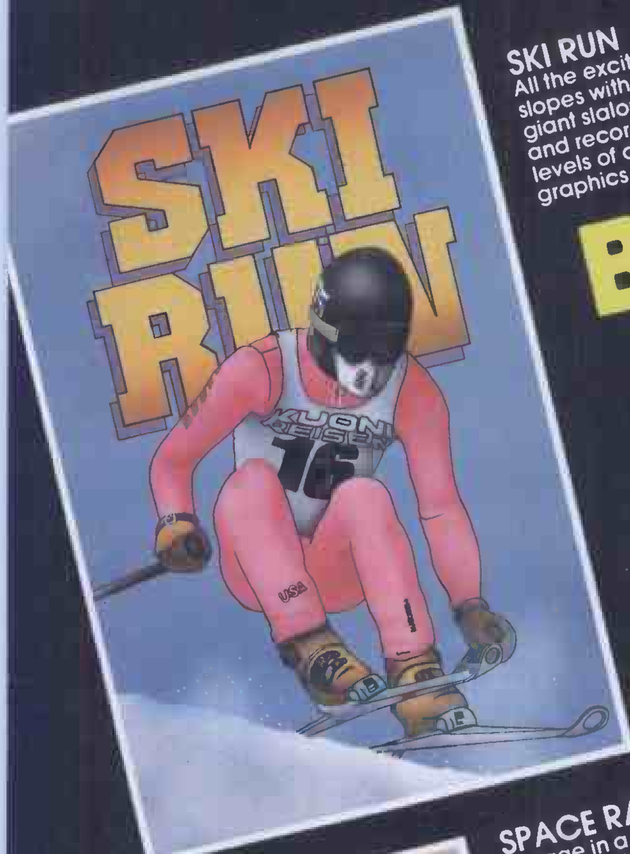
Create your own graphics characters on the screen with this versatile CHARACTER GENERATOR.

- indispensible for SCREEN ANIMATION
- complete with illustrative ANIMATION programs and 4 sample CHARACTER SETS
- SAVE character sets on disc or tape for immediate inclusion in your programs
- Lists VDU 23 commands for typing directly into programs
- Users Guide gives hints on animation and method of using 'imploded' and 'exploded' character sets
- compatible with all Operating Systems

32K memory needed tape or disc **£9.00 incl. VAT**

Please enclose cash with order or an official order form SYSTEM Dept P2, 12 Collegiate Crescent, Sheffield S10 2BA

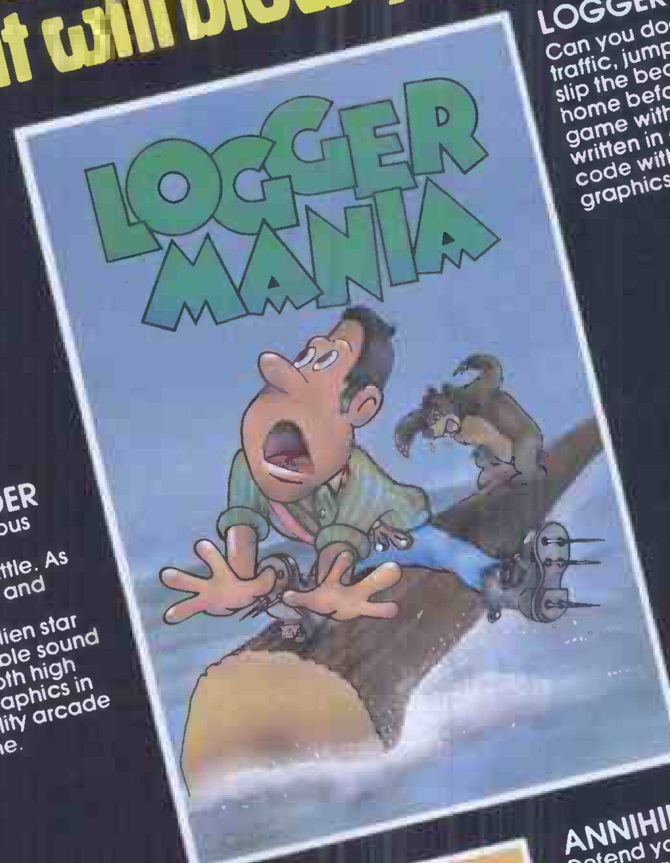

PERFECT WRITER™
Perfect Calc™
Perfect Writer
PSI
Perfect Writer/Speller
Perfect Writer
Perfect Speller
Perfect Filer
Perfect Filer
Perfect Filer
Perfect Calc



SKI RUN

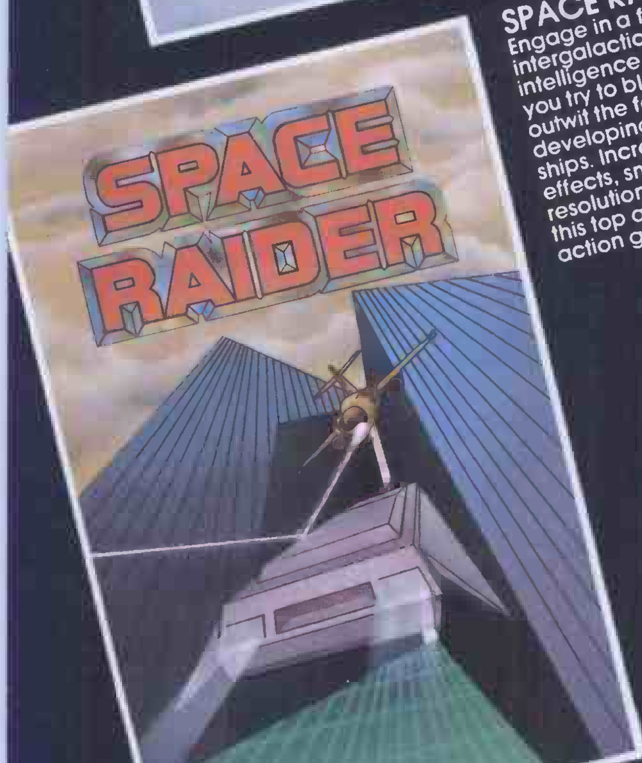
All the excitement and skill of the ski slopes with downhill, slalom and giant slalom. Put yourself to the test and record the fastest time! Nine levels of difficulty. High quality graphics and brilliant sound effects!!

Boom Software
It will blow your mind



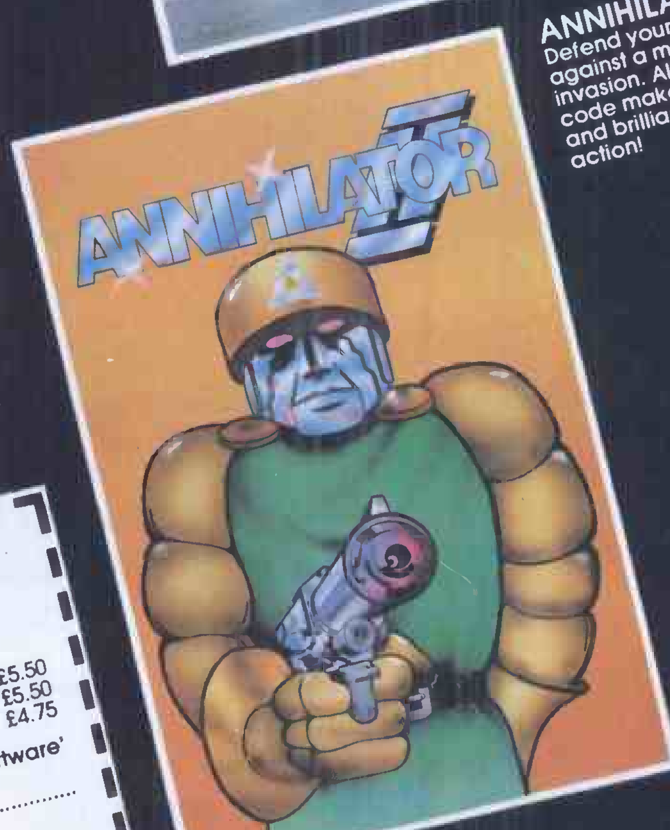
LOGGER MANIA

Can you dodge the traffic, jump your logs, slip the bears, and get home before sunset? A game with a difference written in all machine code with high quality graphics.



SPACE RAIDER

Engage in a furious intergalactic intelligence battle. As you try to blast and outwit the fast developing alien star ships. Incredible sound effects, smooth high resolution graphics in this top quality arcade action game.



ANNIHILATOR II

Defend your planet against a mighty allien invasion. All machine code makes for fast and brilliant arcade action!

Post this coupon now to Boom Software
2-4 Chichester Rents, Chancery Lane,
London WC2A 1EG

Please send me the following:

Ski Run	£5.50	Annihilator II	£5.50
Logger Mania	£5.50	Space Raider	£5.50
Annihilator II (VIC 20)	£4.75	Trek (VIC 20)	£4.75

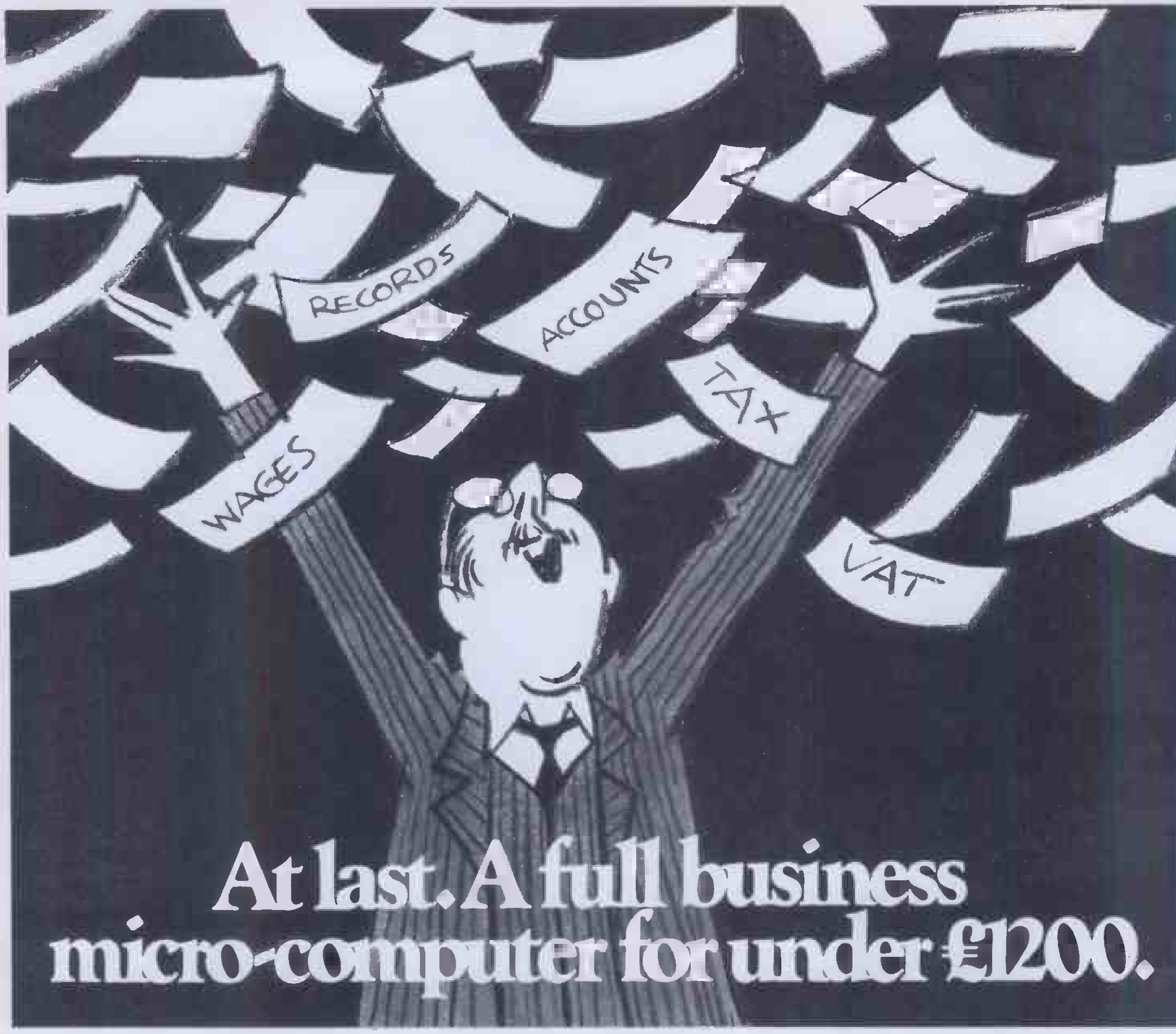
Total cheque/PO enclosed £ .... payable to 'Boom Software'

Name ....

Address ....

....

commodore 64
and VIC 20



Because we at NEC make most of the components for our computers, this naturally gives us a price/performance edge over comparable systems.

Which other company could offer a 64K Byte CP/M system like the PC8000, with dual 5¼" disc drives and monochrome monitor, opening the door to a wide range of business software - including integrated accounting, word processing, business planning and graphics - for *just £1,195?*

Whatever the size of your business, the processing power required, or the volume of data you wish to store - up to 20 megabytes on the APC - there is one of NEC's flexible family of personal computers to give you the best price/performance in its class.

PC-8000 Series
Personal Computer. £1,195*

PC-8800 Series
Personal Computer. £1,455*

APC Advanced
Personal Computer. £1,985*

To: NEC Business Systems (Europe) Ltd., Computer Division, Freepost (no stamp required), 164/166 Drummond St., London NW1 1YP.

NAME

ADDRESS

BUSINESS

PHONE

PLEASE TICK: PC8000 ☐ PC8800 ☐ APC ☐

PCW/2/83

NEC
NEC BUSINESS SYSTEMS (EURDPE) LTD.

★PC8000 64K CP/M SYSTEM DUAL 5¼" DISC DRIVES MONOCHROME MONITOR £1,195 EXCL. VAT.

★PC8800 64K EXPANDABLE SYSTEM MONCHROME MONITOR DUAL 5¼" DISC DRIVES £1,455 EXCL. VAT.

★APC HO2 128K TRUE 16 BIT MICRO COMPUTER WITH DUAL 1 MEGABYTE 8" DISC DRIVES, AND INTEGRAL DISPLAY. £1,985, EXCL. VAT.

NEC DEALERS:

Aberdeen Mr B D West
Tyseal Computers Ltd. 0224-647365
Bath Mr D Broadway
Jade Computers 0761 (36397/8 and 32570)
Birmingham Mr A Bell
Tempus Business Systems 021 477 9789
Borehamwood Mr T Benson
Mastermicro Ltd. 01-953 6368
Bridgnorth Mr A S Vincent
Jentech Services Ltd. 07462 61458
Brighton Mr R F Hunter
Brighton Computer Centre 0273 673114
Bristol Mr J Champion
Cashpoint (EPOS) Ltd. 0272 277518
Bristol Mr A E Smith
Axiom 027 588 5632
Cambridge Mr J Hartley
Eicon Research Ltd. 0954 81825
Canterbury Mr C B Raines
Jutea Ltd. 0227 830083
Charmouth Mr A K Hathway
Fenway Controls Ltd. 0297 60223
Colchester Mr M K Titman M.D.
Emprise Electronics Ltd.
(0206) 865926/870353/47242
Coventry Mr K Hudson
Coventry Micro Centre, The (0203) 58942
Dorchester Mr B Savage
Dataman Designs (0305) 68066
Dundee Mr B D West
Tyseal 0382 22613
Eastbourne Mr J Earl
Omega Point of Sale (UK) Ltd. 0323 761799
Eire Mr L Hester
Pye (0001) 984411
Glasgow Mr P Hughes
Albany Data Systems Ltd. 041 226 4757
Glasgow Mr H Johnston
American Computers & Engineers Ltd. 041 248 2427
Grantham Mr R Eyre
ACC Data Systems Ltd. 0476 66611
Guernsey Mr E Ferbrache
Micrologic Systems Ltd. 0481 28789
(from 1st Sep)
Haslemere Mr A Lamont
Crown Management Systems Ltd.
Nr. Haslemere (042879) 3636
Haywards Heath Mr G Theaksten
Southern Computer Warehouses Ltd (04446) 45311
Hemel Hempstead Mr D Stafford
Chiltern Datalink 0442 212714
High Wycombe Mr M A Curley
Hyford Business Machines 0494 446003
Huddersfield Mr G A Vevers
NMR Computers (0484) 682905
Kingswood Mr P D Boylan 0737 83 2738
Zilobyte Systems 01-588 1936
Leeds Mr M Cullen
Hepworth Computer Services 05324 40265
Leicester Mr G A Holt
Computer Store (Leicester) Ltd. 0533 882955
Liverpool Mr T Best
Startec Computers 051 727 7267
London WC1 Mr C Idnani
London Computer Centre Ltd. 01-387 4455
London WC1 Mr K Lockwood
Abbotsford Office Equipment Ltd. 01-837 3980/5478
London WC1/EC1 Mr R Sharpe 01-405 6231
Berrys (Shortwave) Ltd. 01-831 8001/2
London W1 Mr M R Gadd, Miss K Bird
John Lewis Partnership Dept. 827 Radio & TV
Oxford St. London W1A 1EX 01-629 7711
London NW1 Mr M Kraftman
Bonsai Ltd. 01-580 0902
London SW Mr M Lagan
Interam Computer Systems Ltd. 01-622 9373
London EC Mr B Smith
Marchessa Ltd. 01-726 4809
London EC Mr D Warren
MCB (Microwriting Comms Bureau) 01-437 1388
London N1 Mr I Gibson
POS Marketing (UK) Ltd. 01-837 1165
London N1-N22 Mr J A Wynne
Professional Data Services Ltd.
01-445 6655/446 4889
London W2-W10 Mr M Platt
SSCS Ltd. (Selected Software
& Computer Systems Ltd.) 01-351 5622/6
London NW Mr S Virji
Steiger Computers Ltd. 01-961 6000
Loughborough Mr D O'Sullivan
Data One Systems 0509 37281/2
Manchester Mr S Dewsnap
Desktop Computing Ltd. 092 541 5415
Central Milton Keynes Mr S Robotham
John Lewis Partnership 0908 679171
Morpeth Mr R Owen
Computerit Ltd. (0632) 845262
Newport, Isle of Wight Mr A Medley
Cemoc Ltd. 0983 529 555
Northampton Mr P Scott
Basic Computers & Systems Ltd. 0604 710 740
Nottingham Mr V Skitt
Skytronics Ltd. 0602 781742
Oxford Mr M A Curley
Hyford Business Machines 0865 723511-2-3
Petersfield L Robinson, A Macleod
Strongwight Ltd. T/A Community Computers 0730 87567
Plymouth Mr S Taylor
Teffont 0752 550816
Poole Mr A Thompson
Zymotix Ltd. (0202) 679546
Portsmouth Mr P S Palmer
RDS Computers & Business
Services Ltd. 0705 751194
Reading Mr P McRae
Computer 100 0734 591616
Sandy Mr D Gurney
Electron Systems (Sandy) Ltd. 076 781 195
Stafford Mr B Balcanquall
Computerama (0785) 41899
Swaffham Mr T M B Hunt, M.D.
Breckland Business Systems Ltd. (0760) 21637
Taunton Mr J J Williams
CSM Computer Services 0823 76698
Weybridge Ms S Phibbs
IKS Consultancy Ltd. 97 54526
Whitehaven Mr R Turner
H L Elliott Whitehaven: (0946) 3671
Windsor Mr J Gripton
Computer Electronics Ltd.
Windsor: (07535) 62028 and 55669
Worcester Mr R J Rook
Dateort Ltd. 0905 425195
Worthing Mr S C Shannon
Shannon Personnel Ltd. 0903 36247

VISIT XITAN AT THE SOFTWARE VILLAGE

COMPEC'83

THE SOFTWARE

Word Processing

		CP/M-80	CP/M-86	PC-DOS
WORDSTAR	MicroPro	□	●	*
MAILMERGE	MicroPro	□	●	*
SPELLSTAR	MicroPro	□	●	*
EASYWRITER II	IUS			*
EASYSPELLER II	IUS			*

Data Bases And File Management Systems

		CP/M-80	CP/M-86	PC-DOS
CARDBOX	Caxton	□		*
DATASTAR	MicroPro	□		*
dBASE II	Ashton-Tate	□	●	*
EASYFILER	IUS			*
INFOSTAR	MicroPro	□		*
PERSONAL PEARL	Pearl Software	□	●	*
REPORTSTAR	MicroPro	□		*
RESCUE	MBS	□		
TIM III	Innovative S/w			*

Business Systems, Financial Planning, Accounting

		CP/M-80	CP/M-86	PC-DOS
CALCSTAR	MicroPro	□		*
EASY PLANNER	IUS			*
MICRONET	Abtex	□		
MULTIPLAN	MicroSoft	□		
SAPPHIRE MARS	Sapphire Systems	□	●	
SUPERCALC	Sorcim	□	●	*
MILESTONE	Organic Software	□	●	
GBS (General Business System)	ByteSoft	□		
ISL (Integrated Stock & Ledger)	ByteSoft	□		

Statistics

		CP/M-80	CP/M-86	PC-DOS
MICROSTAT	Ecosoft	□		*

Training Packages

		CP/M-80	CP/M-86	PC-DOS
HANDS-ON BASIC	MicroCal	□	●	
HANDS-ON CP/M	MicroCal	□	●	
HANDS-ON COBOL	MicroCal	□	●	
WP WORKSHOP	MAC	□	●	
FLIGHT SIMULATOR	MicroSoft			*

Languages

		CP/M-80	CP/M-86	PC-DOS
BASIC COMPILER	MicroSoft	□		
BASIC INTERPRETER	MicroSoft	□		
BAZIC	MicroMikes	□		
C COMPILER	Digital Research		●	
CBASIC	Digital Research	□	●	
CBASIC COMPILER	Digital Research	□	●	*
CIS COBOL	MicroFocus	□	●	
COBOL	MicroSoft	□		
FORTRAN	MicroSoft	□		
LEVEL II COBOL	MicroFocus	□	●	
MULISP/MUSTAR	MicroSoft	□		
MUMATH/MUSIMP	MicroSoft	□		
PASCAL/MT+	Digital Research	□	●	*
PASCAL/MT+ & SPP	Digital Research	□	●	
PERSONAL BASIC	Digital Research		●	
PL/I	Digital Research	□	●	*
XBASIC	Xitan	□	●	

(II...

		CP/M-80	CP/M-86	PC-DOS
ACCES...				
ANIMATC...				
AUTOCOD...				
EDIT				
BT-80				
DISPLAY MANAGE...				
FORMS 2				
MACRO				
PROGRAMMERS UTILIT...				
QUICKCODE (for dBASE II)				
SID				
SPP				
WORDMASTER				
XASM18 (1802)				
XASMF8 (F8/3870)	A...			
XASM65 (6502)	Avoc...			
XASM68 (6800/01)	Avocet			
XASM48 (8048/8041)	Avocet			
XLT86	Digital Rese...			
ZSID	Digital Researc...			

Operating Systems

		CP/M-80	CP/M-86	PC-DOS
CP/M	Digital Research	□		
CP/M PLUS	Digital Research	□		
CP/NET & CP/NOS	Digital Research	□		
MP/M II	Digital Research	□	●	
CP/M-86 (IBM PC)	Digital Research		●	
CONCURRENT CP/M-86(IBM PC)	Digital Research		●	

Utilities

		CP/M-80	CP/M-86	PC-DOS
COPYALL	MicroMikes	□		
DESPOOL	Digital Research	□		
DUTIL (for dBASE II)	Fox & Geller	□		
FILESHARE	MicroFocus	□		
FILESTAR	MicroSec	□		
MUCOPY	Wheatcroft Hards	□		
SORT	Microsoft	□		
SUPERSORT	MicroPro	□	●	
SUPERVYZ	Epic	□		
SDISK (Silicon Disk)	Xitan	□		

Communications

		CP/M-80	CP/M-86	PC-DOS
BSTAM	Byrom Software	□	●	*
BSTMS	Byrom Software	□		

Graphics

		CP/M-80	CP/M-86	PC-DOS
DGRAPH (for dBASE II)	Fox & Geller	□		
FASTGRAPHS	Innovative S/w			*
GSX	Digital Research	□	●	
GSS- Kernel	Digital Research	□		
GSS- Plot	Digital Research	□		

Ask us about formats – we put the SOFTWARE you want on the SYSTEM you've got!

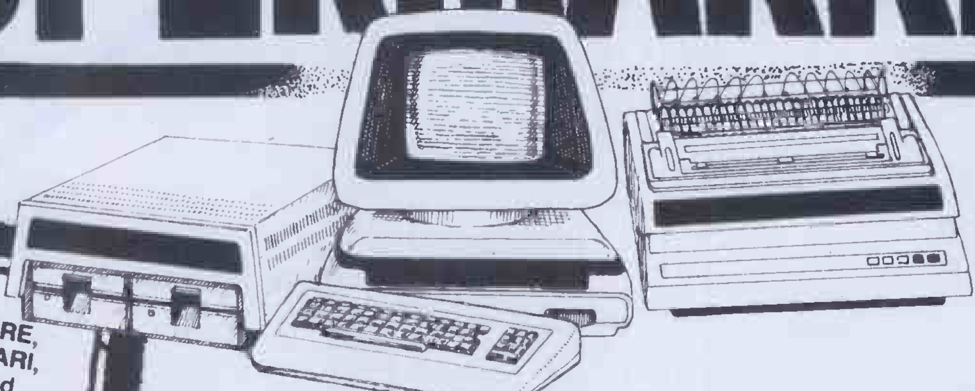
XITAN SYSTEMS

LARGE RANGE

Xitan are main U.K. distributors for Digital Research Inc., MicroPro Inc., Microsoft, Ashton-Tate, Sorcim and IUS, and suppliers of a large range of software from other leading software houses such as Byrom and Ecosoft. Most software can be supplied in a comprehensive range of formats.

Looking After our Dealers - so You Know Where to Look

THE *Computer* SUPERMARKET



COMMODORE, TEXAS, ATARI, DRAGON and EPSON EQUIPMENT
Fully tested before despatch, or collection complete with 13 amp plugs.

Big name hardware at cash-and-carry prices - and with service you'll find hard to match

Telephone for Latest Prices

COMMODORE BUSINESS EQUIPMENT

		EXC. VAT	inc. VAT
4032	12" 40 Col 32K Memory	425.00	488.75
8032-SK	12" 80 Col 32K Memory	580	667.00
8096-SK	12" 80 Col 96K Memory	685.00	787.75
700B	128K Computer W/O Monitor	545.00	626.75
710B	128K Computer With Monitor	825.00	948.75
715B	256K Computer With Monitor	975.00	1121.50
2031	Single Disk Drive (170K)	270.00	310.50
8250	Dual Disk Drive (2MB)	790.00	908.50
8050	Dual Disk Drive (1MB)	790.00	908.50
9060	Hard Disk Drive (5MB)	1795.00	2064.25
9090	Hard Disk Drive (7.5MB)	2395.00	2754.25
4023	Dot Matrix Printer	320.00	368.00
8023	Dot Matrix Printer	565.00	649.75
6400	Daisy Wheel Printer	869.00	999.35
64K	Upgrade Board	225.00	258.75
PET/IEEE	Cable	28.00	32.20
IEEE/IEEE	Cable	30.00	34.50

COMMODORE BUSINESS SYSTEMS

The following prices are for complete systems and must be ordered as such.

System 1	4032/2031/4023 Incl Cables	995.00	1144.25
System 2	8032/8250/4023 " "	1675.00	1926.25
System 3	8032/8250/8023 " "	1885.00	2167.75
System 4	8032/8250/6400 " "	2225.00	2558.75
System 5	8096/8250/4023 " "	1785.00	2052.75
System 6	8096/8250/8023 " "	1975.00	2271.25
System 7	8096/8250/6400 " "	2345.00	2696.75

SIRIUS/VICTOR 9000

Sirius 1	128K Computer/1.2 Meg Disk	1795.00	2064.25
Sirius 2	128K Computer/2.4 Meg Disk	2195.00	2524.25
Sirius 3	256K Computer/2.4 Meg Disk	2395.00	2754.25
Sirius 4	256K Computer/10 Meg H/Disk	3395.00	3904.25

To The Computer Supermarket Ltd.,
Unit 8, Oakley Hay Ind. Estate,
Corby, Northamptonshire.
Please send me

Model No.	Item	Price	Shipment	Total

I enclose my cheque for £ ____________
Or debit my Access/Barclaycard/ Diners Card/American Express No.
(Cardholders may telephone orders to 0536 744015)

Signature ____________
Name ____________
Address ____________

PCW (BLOCK CAPITALS PLEASE)

Your remittance should be made payable to Computer Supermarket Reader's Account, and shall remain your money until the goods have been despatched to you at the address specified
All goods offered are subject to Computer Supermarket conditions of sale, copies available on request. Reg. in England No 2646589

EPSON

		EXC. VAT	inc. VAT
HX 20	Portable Computer 16K	411.00	472.65
HX 20-MC	Microcassette	75.00	86.25
HX 20-EU	Expansion Unit	80.00	92.00
QX 10	192K Computer/640K Disk	1735.00	1995.25
RX80	100 cps Dot Matrix	279.00	320.85
FX80	160 cps Dot Matrix	389.00	447.35
MX 100	132 Col Friction/Tractor	449.00	516.35

COMMODORE HOME COMPUTERS

VIC 20	Starter Pack inc Cassette	121.70	139.95
CBM 64	64K Colour Computer	173.90	199.99
1520	Printer/Plotter	142.00	163.30
1525	Dot Matrix Printer	180.00	207.00
1526	Dot Matrix Printer	285.00	327.75
1530	C2N Cassette	33.91	39.00
1541	Single Disk Drive	185.00	212.75
1701	Colour Monitor	190.00	218.50
SIB6410	Simons Basic Cartridge	41.74	48.00
PRG6400	Programmers Ref Guide 64		9.95
2803	Programmers Ref Guide VIC		9.95

HOME COMPUTERS & ACCESSORIES

TI 99-4A	16K Personal Computer	86.91	99.95
Dragon 32	32K Personal Computer	152.17	175.00
Oric	48K Personal Computer	T.B.A.	T.B.A.
Sord M5	20K Personal Computer	129.56	149.00
Quickshot Joystick		10.39	11.95

Large stocks of software for most of the popular micros. Ring for latest stock and prices.

Prices Quoted include all delivery charges.
Where fast delivery is required Datapost is available or for larger items TNT Overnight. Prices on request.

EXPORT ARRANGED ANYWHERE IN THE WORLD
THE COMPUTER SUPERMARKET (EXPORT) LTD can ship most computers to most parts of the world. Write or phone for details.

All goods sold with full manufacturer's warranty and subject to conditions of sale (available on request).
ALL MACHINES ARE FULL UK STANDARD.

Prices are valid only for the cover date month of this magazine
Credit Facilities Available. Ring or write for full details.
All orders will be acknowledged by return of post.

THE COMPUTER SUPERMARKET LTD.

UNIT 8, SOUTHFOLDS ROAD, OAKLEY HAY IND ESTATE, CORBY, NORTHAMPTONSHIRE
TELEPHONE 0536 744015 (3 LINES) TELEX COMPSU 341543/4

If the number of computer systems on the market leaves you totally bewildered, we don't blame you.

And that's not your only problem. If you are not very careful, the system you buy today could well be obsolete tomorrow. That's how fast computer technology is progressing.

But take heart. There is one computer system that won't become obsolete. Because it is modular in concept it can be expanded both inside and outside to accommodate extra capacity and new advances – as well as being able to increase in size and capability to keep pace with your own growth or changing requirements.

You have a choice from a virtually unlimited range of CP/M compatible application software. Plus the support of total dealer back-up.

And, most important, you won't find that you've bought a system that suddenly doesn't meet your needs. The Communicator offers the facility to enhance and upgrade existing models to take account of new applications.

Comart have also met the stringent CCTA requirements. Which means we are A1.
In short, Comart Communicator systems can keep pace with both progress and innovation.

So don't get bogged down with obsolete equipment. Contact your Comart dealer for a demonstration now.

The Comart Communicator. One computer system that won't sink into obsolescence.

What's more, it's British.

At any one of the addresses listed below you can see the remarkable flexibility of a Comart Communicator system for yourself.

In under three years, it has become a complete family of compatible, fully expandable microcomputer systems, covering 20 models and including single user, multi-user and multi-processing systems.

To become technical for a moment, there's a choice of 8 or 16 bit processors, up to 1 megabyte of RAM and a wide range of floppy and hard disk storage capacities and add on modules.

COMART COMMUNICATOR SPECIFICATIONS

	CP100 Series Systems	CP1000 Series Systems
Microprocessors:	8 Bit Z80A (1 to 6)	16 Bit 8086
Memory:	64K-512K bytes	256K-1M byte
Storage:	390K or 790K byte diskettes 5M or 20M byte hard disks	390K or 790K byte diskettes 5M or 20M byte hard disks
Operating Systems:	CP/M, MP/M11 & CP/NET, multi-processor 1 to 5 users	CP/M86, MP/M86, MS-DOS, 1 to 8 users

Features common to both CP100 & CP1000 Series Systems
Keyboard/Display: 105 Key, detached 14" green screen, swivel/tilt,
Expansion: Internal – S100 cards, mainframe communications & protocols,
Expansion: External – stackable modules inc. cartridge tape & 8" floppy & hard disks

comart

Comart Limited, Little End Road, Eaton Socon, St. Neots, Huntingdon, Cambridgeshire PE19 3JG. Tel: (0480) 215005. Telex: 32514 Comart G

Member of the Comart Group of Companies

COMART COMMUNICATOR UK DEALERS

ABERDEEN MOM Offshore Tel: 0224 22520
AYLESBURY J.K. Wakeford Associates Tel: 0296 27473
BEDFORD Remdex-Bradley Tel: 0234 68581
BEDS (AMPTHILL) M.E. Marketing Tel: 0525 404262
BELFAST Cardiac Services Co Tel: 0232 625566
BIRMINGHAM The Byte Shop Tel: 021-622 7149
CAMBRIDGE Cambridge Computer Store Tel: 0223 65334
CAMBS (ST NEOTS) Westcom Tel: 0480 217217
CHANNEL ISLES Bell Data Systems Tel: 0481 23671
COLCHESTER Eurotec Consultants Tel: 0206 72538
DONCASTER Spot Computers Tel: 0302 25159
DUBLIN (EIRE) Lendac Data Systems Tel: 0001 710226
EDINBURGH Holdene Microsystems Tel: 031-557 4060
GLASGOW The Byte Shop Tel: 041-221 8202
GLENROTHES Computer Services Scotland Tel: 0592 773710
LEEDS Holdene Tel: 0532 459459
LONDON (BRIXTON) Jarogate Tel: 01-671 6321
LONDON (COVENT GARDEN) Digitus Tel: 01-379 6968
LONDON (EC4) Zygal Dynamics Tel: 01-248 4883
LONDON (NW1) The Byte Shop Tel: 01-387 0505
LOUGHBOROUGH Data One Tel: 0509 37281
MANCHESTER The Byte Shop Tel: 061-236 1737
MANCHESTER NSC Computers Tel: 061-832 2269
NORWICH Eastern Bus. & Accounting Systems Tel: 0603 27460
NOTTINGHAM The Byte Shop Tel: 0602 40576
OXON (BICESTER) Zygal Dynamics Tel: 08692 3361
READING M.E. Electronics Tel: 0734 667663
SOUTHAMPTON The Byte Shop Tel: 0703 334711
STAINES Newbury Data Recording Tel: 0784 61111
SWINDON Great Western Computing Tel: 0793 485517
WATFORD Lux Computer Services Tel: 0923 47367
WILMSLOW Holdene Tel: 0625 529486
WINDSOR Romtec Tel: 075-35 51550
WORTHING Ace Computing Services Tel: 0903 35411

RANK XEROX

Aicrocomputers? _et Rank Xerox point you n the right direction.

If you're confused about which microcomputer stem is *exactly* right for your office, let Rank Xerox be ur guide.

Today, with so many systems available, it makes nse to deal with just *one* company who can supply all ur microcomputing needs – the hardware, and ecifically tailored software.

The advantage: total compatibility. There's no opping around for compatible equipment (printers, sc drives, etc.); just look for the Xerox name. You'll nd it on every item you require to quickly establish a st-effective micro-computer system.

Also, Rank Xerox offer you the "Helpline" service. s its name suggests, we don't just provide you with the ght microcomputer system for your business, we also elp you through those first vital stages of operation. ny questions, just call us and our specialists will work ith you on a telephone link. No charge.

On-site servicing is another benefit of choosing ank Xerox. And it's prompt.

owerful microcomputers designed to elp you manage your business better

Not just power, but simplicity, too. And such ompactness. Keyboards and controls have been more oughtfully designed to make working with Xerox icro-computers easier and more comfortable.

The new Xerox 820 II range, for example, has all e built-in memory and operating power you could ossibly need. It's CP/M* based with 8-bit or 16-bit ersions. You could select the advanced 820 II HRG, with on-screen graphics for plans, graphs and so on.

For extremely powerful word processing and microcomputing together in one complete system, there's the Xerox 823.

And remember, these are *expandable* systems that grow as your business needs grow. At the same time, they're *adaptable* systems, with many disc drive and printer options to suit your requirements.

Software for every aspect of your more efficient business.

Every aspect of your business can be controlled more efficiently by you and your better designed Xerox microcomputer.

Budgetry and financial analysis, records and data management, word processing, plus specific business accounting packages that help you to calculate payroll, update sales ledgers, and monitor stock control, and more.

Suddenly, you have instant access to all the information you need to make informed business decisions – information you can update, manipulate, and store on easy-to-file discs.

You're able to work in your choice of computer languages too, including BASIC, Pascal, Cobol and APL.

Which Xerox microcomputer system is right for you? Let us point you in the right direction right now. To the coupon below. Simply fill in and freepost it today.

Alternatively call our 24-hour enquiry service. Dial the operator and ask for Freefone Rank Xerox.

*® *CP/M is a registered trademark of Digital Research Inc.*
® *Xerox and Rank Xerox are registered trade marks of Rank Xerox Ltd.*

FREEPOST THIS COUPON TODAY! NO STAMP REQUIRED.
To: Rank Xerox (UK) Ltd, Freepost, Admail 38, London NW1 1YH.

☐ Yes, I'd like to know more about the Xerox 820 II series of microcomputers. Please ask my local authorised dealer to contact me soon, to arrange a demonstration.

Name ______
Position ______
Telephone Number ______
Company/Organisation ______
Address ______
______ Postcode ______
Type of Business ______

☐ Please tick if you are a Rank Xerox Customer. PCW.11.83

24-HOUR ENQUIRY SERVICE. ASK THE OPERATOR FOR
FREEFONE RANK XEROX
OR DIAL 01-380 1418.

COMART SUBSYSTEMS

PRICES EXCL. VAT

Comart CB200 Cartridge Tape Back-Up Subsystem for Hard Disk 2495.00
Comart HD520 5" x 20M Byte Hard Disk Subsystem (requires HDCONT or can be added to a CP520 or CP 1520) 2395.00
Comart HDCONT Winchester Disk Controller for 2, 20M Byte Drives 195.00
Comart FD800 8" Floppy Single Disk Drive Subsystem; Single Sided, Single Density IBM 3740 Compatible (requires C-IFDC) ... 995.00

S100 BOARDS

Comart CRAM64 64K Byte Dynamic RAM with Bank Select 200.00
Comart CMPU Multi-Processing Add-In Card with Z80A Slave Processor, 64K Byte Dynamic RAM 2X Serial & 1X Parallel Interface ... 495.00
Comart CRAM256 256K Byte Dynamic RAM with Parity. 8 and 16 Bit Data. IEEE696 Compatible. Also supports 8 Bit Bank Switching 550.00
Comart C-CPU86 8086 Processor Card, with Dual Serial and Parallel Ports. Monitor in 8K EPROM and 4K RAM 300.00
Comart C-IFDC Intelligent Diskette Drive Controller with Z80A Processor 295.00
Comart C-CPU Z80A system Processor Board incl. 2 Serial/1 Parallel Port 200.00
Comart 4S 10 4 Channel Synch/Asynch Interface Board 250.00

VDU'S & MONITORS

Comart WY100 Visual Display Terminal, Green Display, 24 × 80 and Status Lines. Detached 105 Key Keyboard with Numeric Pad, Function, Cursor and Editing Controls. Swivel and Tilt Display 725.00
Comart WYSEWORD Wordstar option ... 30.00
Comart WY101 VDU with two Page Memory 775.00
Volkercraig 4404 .... 595.00
Volkercraig 4404WS 695.00
12" Green Screen Monitor 99.00

HOME COMPUTER SOFTWARE
Available for IBM PC & BBC,
Call for availability.

DISKETTES

DYSAN 5¼" 48 TPI SOFT OR HARD SECTORED
Single Sided, Single Density 2.45ea
Single Sided, Double Density 2.61ea
Double Sided, Double Density 3.80ea
DYSAN 5¼" 96 TPI SOFT OR HARD SECTORED
Double Sided, Double Density 5.70ea
DYSAN 8" IBM 3740 FORMAT
Single Sided, Single Density 3.00ea
Single Sided, Double Density 3.57ea
Double Sided, Double Density 4.20ea
Byteshop 5¼" Single Sided, Single Density 1.70ea
Byteshop 5¼" Double Sided, Double Density 2.13ea

CP/M SOFTWARE

BASCOM Microsoft Basic Compiler 272.00
BASIC-80 Microsoft Basic Interpreter .. 241.00
BAZIC Micromikes Basic Language 120.00
BSTAM BYROM Software Communications Package* 130.00
BSTMS BYROM Software Communications Package 130.00
C-86 D/R C Language with UNIX Version 7 Compatible Run Time Library 226.00
CALCSTAR Micropro Financial Planning Electronic Spread Sheet Package 90.00
CARDBOX Caxton Store/Search System 155.00
CB80 Digital Research Basic Compiler 323.00
CB86 D/R Basic Compiler 226.00
CBASIC Digital Research Basic Language 97.00
CBASIC/86 D/R Basic Language 210.00
CIS COBOL Microfocus COBOL Language* 425.00
COBOL-80 Microsoft COBOL Compiler .549.00
CP/M-86 DISPLWR Digital Research Operating System 210.00
DATASTAR Micropro Database Package 175.00
DBASE II Ashton-Tate Relational Database + ZIP* 437.00
FILESHARE (CIS) Microfocus Utility 250.00
FILESTAR Microsec's Disk Reformatter CP/M to IBM, DEC, Motorola and Intel Formats .. 110.00
FINANCIAL PLANNER Ashton-Tate Financial Plan* 437.00
FORMS 2 Microfocus Table Maker* 110.00
FORTRAN-80 Microsoft FORTRAN Compiler 369.00
GBS Bytesoft General Business System 795.00
INFOSTAR Micropro Database Reporter 295.00
ISL Bytesoft Accounting Package 1095.00
LEVEL II COBOL Microfocus Language* 965.00
MACRO-80 Microsoft Macro Assembler 137.00
MAILMERGE Micropro Wordprocessing Enhancement to link with WORDSTAR* 145.00
MARS Sapphire Business System* 395.00
MICROSTAT Ecosoft Statistics Package 210.00
MILESTONE Organic Software Critical Path Package* 225.00
MULTIPLAN Microsoft Financial Planning Package 199.00
PASCAL/MT+ D/R Pascal Language with Speed Programming Tool 323.00
PASCAL/MT+86 Digital Research Pascal Language for 16 Bit Systems 387.00
PEACHTREE Basic Accounting System per module 325.00
PEACHTREE Business Management System per module 600.00
PERSONAL BASIC D/R language* 97.00
PERSONAL PEARL Pearl Data Base/FM* 190.00
PL/1-80 Digital Research Language ... 355.00
PL/1-86 Digital Research Language ... 489.00
REPORTSTAR Micropro Reporter 210.00
RESCUE MBS Database 295.00
SPELLSTAR Micropro Proofreading Utility to link with WORDSTAR* 145.00
SUPERCALC Sorcim Financial Planning/Budgeting Spread Sheet Package* 126.00
SUPERCALC 2 Sorcim Financial Planning Package* 190.00
SUPERSORT Micropro Sort Utility 145.00
SUPERVYZ Epic Application Control 97.00
T/MAKER II Lifeboat Associates Financial Planning/Spread Sheet Package 195.00
WORDSTAR Micropro Wordprocessing Package* Also available with Mailmerge and Spellstar 295.00
WP WORKSHOP MAC Ltd Training Guide for WORDSTAR or MAILMERGE 75.00
X BASIC Xitan Language 185.00
BASIC 86 Xitan Language 250.00

Many Utilities, Programming Tools and Training Packages available. Also extensive range of diskette formats. Prices include configuration on machines supplied by ourselves. We are totally committed to after sales service and future support.
*These software packages are available for both CP/M and CP/M86.

ALL PRICES EXCLUSIVE OF VAT
*Barclaycard Visa & Access cards taken in payment.
*Shop opening hours 9-5.30, check individual shops for details of Saturday opening times.
*Phone Mail Orders accepted. Please contact nearest shop for P.P. & Delivery Rates. Regret no C.O.D.

SYSTEM SPOTLIGHT

ACT APRICOT

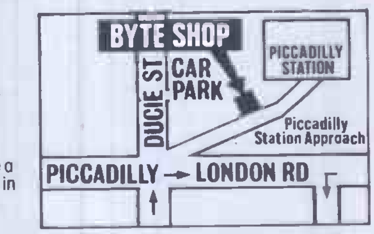
Introducing the new Apricot from ACT, a true 4th generation 16-Bit personal computer at a more than competitive price. Ergonomically styled and sufficiently compact to be considered a truly transportable system. One of the most interesting features of the Apricot is the Microscreen facility, a unique two line LCD display with six associated touch sensitive keys incorporated in the detachable multi-function keyboard. This permits the microscreen to display day, date and time; double as a powerful calculator; provide for dynamic labelling selection; serve as an entry line for information and act as a display window when a full monitor is not available. The monitor display is 25 lines × 80 characters offering high res. graphics 800 × 400 pixels. The keyboard also has its own 'mouse trap' thus enabling selections on the screen to be made simply and easily. The Apricot specification includes a powerful 256K byte memory as standard expandable to 768K bytes. Disk storage is provided by utilising revolutionary 3.5" sony disk drives which offer 315K bytes of storage per drive. The Apricot comes with three operating systems as standard – MS-DOS 2.0, CP/M-86 and Concurrent CP/M-86 plus Microsoft BASIC and Personal BASIC languages. The Apricot is software compatible with both the IBM PC and ACT Siriius 1, giving access to a vast library of readily available application software. For full range of application software see CP/M-86 and IBM software listing.

£1750
£1895.00 INC. MONITOR

- Some items may be subject to a dollar surcharge if the dollar exchange rate changes more than 5 cents. Prices will be adjusted in line with the rate prevailing at the time of purchase.
- Prices subject to change without notice E.&O.E. and are valid for the cover date life of this magazine (November 83)
- Whilst we carry a vast range of stock, we cannot guarantee that every advertised item will be available in each shop.
- All goods are new and include factory warranties.
- No refunds on opened software.
- Orders from Government Depts., Colleges & BFPO addresses welcome for orders above £25.
- Leasing & HP facilities available – apply for written details.
- Detailed prices available on request.

WHERE TO FIND US: MANCHESTER

Train commuters to Manchester will probably be aware of the location of the Byteshop Manchester already, but for those not in that category, our store can be found on the Approach to Piccadilly Station. The Byteshop has been in Manchester for the past five years and Manager Robin Pimlott has gathered around him a highly experienced team of DP Professionals. They will be pleased to arrange a demonstration from the wide range of micros in stock in the newly refurbished demonstration area. Give them a call on 061-236 4737.



BYTESHOP FOR THE BUSINESSMAN

You wouldn't go to a lawyer for medical advice, or take your tax problems to a doctor. It's just as illogical to talk computers to anyone but a computer expert.

Every Byteshop is a specialist computer store. In it you will find nothing but computers and computer people. There is nothing else to distract you. Every Byteshop can show you the very latest personal computer systems and provide solutions to both specific and specialist requirements. Word processing, production control, accounts financial planning and data bases are just a few of the most popular applications.

We can also offer everything allied to micro-computers, such as stationery, diskettes, boards, ribbons for your printer, books, tapes and print wheels.

Just as important, you will have the undivided attention of a computer expert. Our staff have been trained on all our machines and peripherals and can give you sound advice and assistance with complete impartiality.

Even if you have to travel a few extra miles it will certainly pay to come to the experts.

THE BYTE SHOP

Your Specialist Computer Centre

LONDON
The Byteshop,
324 Euston Road NW1 3BG
Tel: 01-387 0505

GLASGOW
The Byteshop,
266 St. Vincent Street, G2 5RL.
Tel: 041-221 8202

NOTTINGHAM
The Byteshop,
92a Upper Parliament Street,
NG1 6LF. Tel: 0602 470576

BIRMINGHAM
The Byteshop,
94-96 Hurst Street, B5 4TD.
Tel: 021-622 3165

MANCHESTER
The Byteshop, 11 Gateway House,
Piccadilly, Station Approach,
M1 2GH. Tel: 061-236 4737

SOUTHAMPTON
The Byteshop,
23 Cumberland Place, SO1 2BB.
Tel: 0703 334711

Members of the Comart Group of Companies

SAVE UP TO £2,200
ON COMPLETE SIRIUS AND FORTUNE SYSTEMS

We've reduced Printer and Software prices to next to nothing to give you the benefits of these complete system prices.

THE ACT SIRIUS ONE

All Sirius systems quoted with 256KB RAM and Silicon Office Software.
We chose Silicon Office as the best single system for the Sirius.
SYSTEM A – Sirius with 80 column NEC 8023 Dot Matrix
SYSTEM B – SIRIUS with 132 column FACIT 4512 Dot Matrix
SYSTEM C – Sirius with 132 column NEC Spinwriter

Sirius 1.2Mb Floppy

	normally	our price	you save
A	£3775	£2999	£776
B	£4075	£3240	£835
C	£4942	£3730	£1212

Sirius 2.4Mb Floppy

	normally	our price	you save
A	£4080	£3400	£680
B	£4380	£3570	£810
C	£5247	£4060	£1187

Sirius 10Mb Winchester

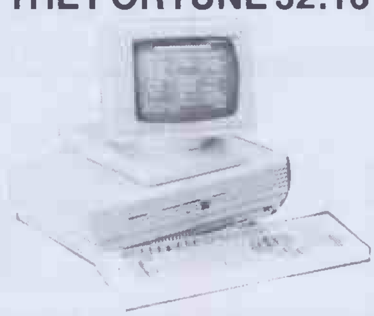
	normally	our price	you save
A	£5180	£4170	£1010
B	£5480	£4340	£1140
C	£6347	£4830	£1517

SILICON OFFICE
THE FLEXIBLE SOFTWARE SYSTEM

If you do not want Silicon Office then we'll supply any other Sirius Software instead to the value of £790*

*Subject to availability

THE FORTUNE 32:16



Winchester	Single User			Multi User		
Size	Normally	Our Price	Save	Normally	Our Price	Save
5Mb	£6607	£5200	£1407	£6607	£5200	£1407
10Mb	£7667	£5990	£1677	£9667	£7500	£2167
20Mb	£8607	£6890	£1717	£11107	£8900	£2207

All systems with 384Kb memory and Fortune: Word – Hence will run the majority of packages available for the Fortune.

*Single User may not be upgraded to Multi User. Multi User may have up to a maximum 16 terminals added.

We will personally deliver and install your system anywhere in the country and spend the day with you to ensure that you are satisfied with the system and know how to use it.

All equipment is new – with standard manufacturers warranties (and NO pirate software).

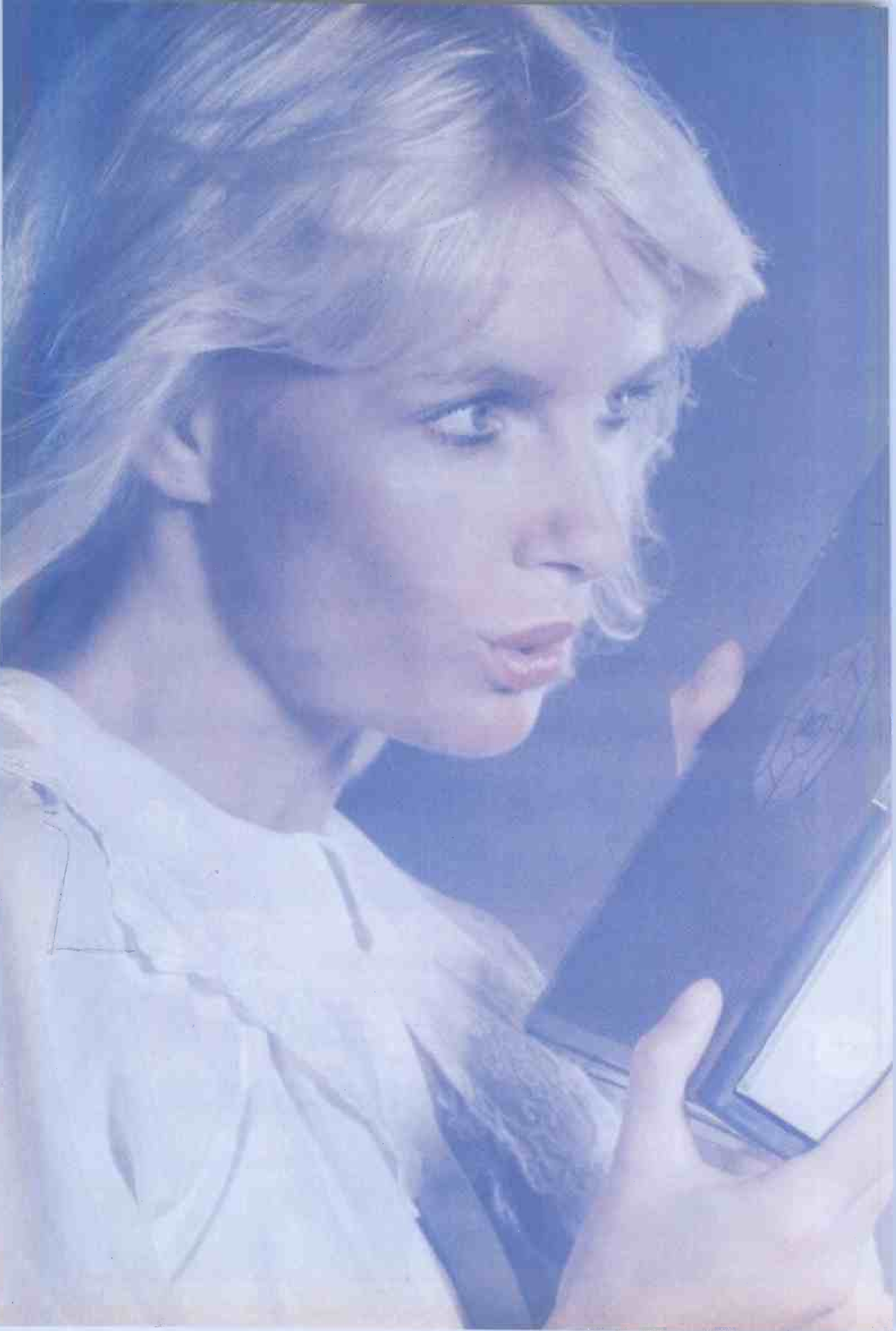
Software Support contracts and training available if you find you have any trouble learning to use the system (which you probably won't, as the two systems quoted are the most user friendly around.). Contracts at just 10% of system price/year. Standard hardware maintenance available.

TO ORDER – Just send your company's official order form to us at Jade Computers, Coombend, Radstock, Bath, Avon or telephone for details of HP, leasing etc, on 0761 36397.

IT'S AS SIMPLE AS THAT

NB: All prices are for the systems quoted only with price reductions coming from printers and software. Individual items are at standard manufacturers retail prices. Cash on delivery required with all orders. Extra £100 charge for 21 days credit terms.

jade
COMPUTERS LTD.
Coombend, Radstock.
TEL: RADSTOCK 36397



PULSAR BLUE
Heaven sent for IBM users.

Pulsar, the 16-bit business software which became a best seller on the Sirius 1 microcomputer is now available for IBM PC users. Already over 10,000 Pulsar systems have been sold, bringing the benefits of true 16-bit computing to multinational companies, small businesses and institutions throughout the UK.

Pulsar Blue is an integrated range of commercial accounting, office systems, planning and modelling software from ACT bringing a new dimension to personal computing. Pulsar Blue is powerful, but friendly. Help routines, concise documentation and simple menus built in to the programs ensure that first time users can quickly familiarise themselves with even the most sophisticated systems. This combination of user friendliness and powerful processing has made Pulsar the most successful 16-bit business software in the country. And its available from IBM dealers now.

Pulsar Blue – a gift from heaven for IBM users.

The Pulsar Blue Range			
Sales Ledger	£195	dBase II	£395
Purchase Ledger	£195	MicroModeller™	£595
Nominal Ledger	£195	SuperCalc 2™	£175
Payroll	£195	SuperCalc 3™ (graphics spreadsheet)	£295
Stock Control	£195	Multiplan™	£195
Invoicing	£195	Wordstar™	£295
Data Analysis	£195	MailMerge™	£95
Informer Database	£295	SuperWriter™	£295

For more information on Pulsar Blue for the IBM PC clip the coupon and return to

ACT (Pulsar) Ltd
Freepost
Birmingham B16 1BR
or call 021-455 7000

Please send me details of Pulsar Blue – business software for the IBM user.

Name ____________

Position ____________

Company ____________

Address ____________

Tel ____________

™ indicates registered trade mark. Ownership details on request. All prices exclude VAT.

BOS SOFTWARE

SERVING THE BUSINESS WORLD

BOS/SALES LEDGER
Provides facilities to maintain customer accounts from entry of invoices, credit notes, payments and journals through to credit checking, production of statements and cash forecasting. Both balance forward and open item accounting are available.

BOS/INVOICING
Provides facilities to produce invoices and credit notes and sales analyses by customer, product, territory and salesman. BOS/Invoicing automatically maintains stock records and sales ledger accounts. BOS/Invoicing requires BOS/Sales Ledger.

BOS/INVENTORY CONTROL
Provides facilities to maintain stock records, to record and control stock issues and receipts, to check re-order levels and lead times and to provide total financial management of stock.

BOS/PURCHASE LEDGER
Provides facilities to maintain all aspects of a company's purchase ledger from the logging of transactions and the approval of payments, through to the calculation of discounts, scheduling of payments, printing of cheques and credit transfers and the maintenance of supplier details.

BOS/NOMINAL LEDGER
Provides facilities to maintain all aspects of a company's accounts. BOS/Nominal Ledger accepts input directly or from BOS/Sales Ledger, BOS/Purchase Ledger or BOS/Fixed Assets and produces profit and loss statements, trial balances, balance sheets and detailed schedules by company, department and account type.

BOS/PAYROLL
Provides all the facilities to produce payslips, credit transfers and management reports for a company payroll. BOS/Payroll fulfils all Inland Revenue requirements for the calculation of tax deductions, contracted-in and contracted-out National Insurance, and covers SSP reporting (UK).

BOS/ORDER PROCESSING
Handles all aspects of multi-warehouse sales order processing: back orders, forward orders, regular orders, picking lists, delivery notes and invoices. Order details per product and per client can be displayed on demand. BOS/Order Processing requires BOS/Sales Ledger and operates in conjunction with BOS/Inventory Control and BOS/Microsafes.

BOS/FIXED ASSETS
Maintains a complete register of the fixed assets of a company or group of companies, and calculates depreciation automatically either by historical cost or current cost conventions. Current cost accounting conforms to SSAP 16 (UK).

BOS Software's extensive experience in international software satisfies the needs of our clients, not only in the UK, but throughout the world.

Choose **BOS Business and Office Software** and you will be buying not only the most comprehensive quality range of software available for the micro market, but also **BOS Software's** five years of international experience.

BOS Software is supplied in the UK by MPSL.

For further details of **BOS Software** complete this coupon, clip to your business card or letterhead and return to **MPSL.**

MPSL, 87-89 Saffron Hill,
London EC1N 8QU, England.
Telephone: 01-831 8811 Telex: 22763

BOS
BUSINESS OPERATING SOFTWARE

Name

Company

Type of Computer

PCW/11/83

COMMODORE COMPUTERS

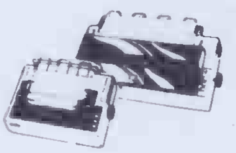
Commodore 64 £233 (£209) £229. Vic 20 with free cassette recorder, basic course and games £143 (£149) £179. Converter to allow most ordinary mono cassette recorders to be used with the Vic 20 and Commodore 64: built £9.78 (£9) £11, kit £7.47 (£7) £9. Commodore cassette recorder £43 (£44) £50. 1541 Disc drive £233 (£209) £234. 1525 Printer £235 (£220) £245. 1526 Printer £350 (£330) £360.

OTHER COMPUTERS

32k expanded Colour Genie £172 (£166) £196. BBC Model B £492 (£440) £480. Dragon 32 £212 (£202) £225.

ORIC AND SINCLAIR COMPUTERS

Oric 1 computer 48k £143 (£141) £151. Oric 1 16k £110 (£112) £122. Oric colour printer £165 (£159) £169. Sinclair Spectrum 48k £131 (£133) £143. Spectrum 16k £101 (£107) £117. 32k memory upgrade kit for 16k Spectrum (issue 2 only) £31 (£28) £30. Fuller master unit for the Spectrum including speech synthesiser, amplifier and joystick ports £56 (£56) £62. Keyboards with proper spacebars for the ZX81 and Spectrum £43 (£41) £47. ZX printer with 5 free rolls paper £41. ZX printer alone £36 (£45) £50. 5 printer rolls £13 (£16) £21. ZX81 £37 (£37) £47. Special offer pack ZX81 computer + 16k RAM pack + game tape £49 (£55) £65. ZX81 16k RAM packs £31 (£28) £30. New luxury Spectrum computers 48k with full sized typewriter keyboards complete with normal space bar enclosed in a larger plastic case which also houses the computer pcb £162 (£174) £190.



PRINTERS

Epson RX80 £326 (£309) £340. Shinwa CTI CP80 £293 (£271) £312. Epson FX80 £440 (£408) £438. Epson MX100/3 £494 (£465) £495. Seikosha GP100A £234 (£219) £254. Oki Microline 80 £243 (£227) £268. The Silver Reed, the latest miracle, a combined daisy wheel and electric typewriter for only £448 (£425) £455. Juki 6100 proportional daisy wheel printer £423 (£404) £434. MCP40 colour printer £165 (£159) £169. Star STX80 thermal printer £165 (£159) £169. We can supply interfaces to run all the above from Sharp computers £58 (£52) £55.

SWANLEY ELECTRONICS

Dept PCW, 32 Goldsel Rd., Swanley, Kent BR8 8EZ, England.

Tel: SWANLEY (0322) 64851. Nothing extra to pay. All prices are inclusive. UK prices are shown first and include post and VAT. The second price in brackets is for export customers in Europe and includes insured air mail postage. The third price is for export customers outside Europe (including Australia etc) and includes insured airmail postage. Official orders welcome.

Saga Software House

Saga

SCIENTIFIC AND BUSINESS PACKAGES FOR BBC-MODEL B, COMMODORE-64, SPECTRUM-48K, ZX-81(16K)

STATISTICAL LIBRARY

UNIVARIATE STATISTICS

All three tapes carry a DATAFILE that enables the user to INPUT-EDIT-SAVE-READ data on tape.

		CASSETTE (£)	DISK (£)
TAPE I:	DESCRIPTIVE STATISTICS	6.99	
TAPE II:	STATISTICAL TESTS	14.95	
TAPE III:	PROBABILITY DISTRIBUTIONS	14.95	
UNIVARIATE LIBRARY (TAPE I-III)		30.00	40.00

MULTIVARIATE STATISTICS

TAPE IV:	MULTIVARIATE DATAFILE Cross-tabulations; correlation coefficients	19.95	
TAPE V:	STEP-WISE MULTIPLE REGRESSION ANALYSIS OF VARIANCE IN REGRESSION AUTOCORRELATION MODELS	19.95	
TAPE VI:	PRINCIPAL COMPONENTS	19.95	
TAPE VII:	FACTOR ANALYSIS VARIMAX ROTATION	19.95	
TAPE VIII:	TIME-SERIES ANALYSIS AND FORECASTING MODEL FITTING AND EXPONENTIAL SMOOTHING	19.95	
MULTIVARIATE LIBRARY (TAPE IV-VIII)		85.00	95.00
STATISTICAL LIBRARY (TAPE I-VIII)		100.00	125.00
ZX-81 (No DATAFILE facility)		70.00	

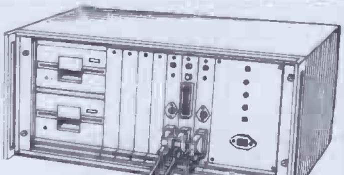
Saga Software House

133A High Street Acton
London W3 6LY

DENNIS COMPUTER SYSTEMS

Based around the powerful 8 Bit Motorola MC 6809 processor this High Res. Microcomputer System is available in kit form using 8" × 8" boards. It can interface with many peripherals inc. printers, terminals, monitors & disk drives and is supported with the proven FLEX disk operating software enabling it to be developed into a really powerful Microcomputer system for Business, Engineering, Education or the Hobbyist.

Previously known as 77-68 and 'The ECM HI-RES. Computer Project' it has been thoroughly researched and developed in the last 2 years and has been renamed the DENNIS COMPUTER SYSTEM. It is now distributed exclusively by Stirling Microsystems.



RANGE OF BOARDS

	Board	Kit
6809 CPU. MC 6809 Processor running at 1MHz. EPROM Socket for 2716 (2K)	£15.00	£60.00
SP Bug Monitor £28.00. SP Bug Listing only £5.00		
64K RAM. Uses 8 × 4164 (64K × 1) memory chips. Extended page facility for 4 boards per system	£28.75	£125.00
HI-RES. GRAPHICS. 8 Colours, including black & white 512 × 512 RES. using Thompson 9365		
Monochrome version	£46.00	£195.00
Colour version	£46.00	£275.00
HI-Bug Monitor £23.00. HI-Bug listing only £5.00		
DISK CTRL. Single or Double Density on 5" disks. Single Density only on 8" disks	£28.75	£138.00
VDU. 40 Column by 24 Row Text Display ASc11 Encoded Keyboard Input Port	£15.00	£75.00
SM Bug Monitor £23.00. SM Bug listing only £5.00		
CASSETTE. Operates at 300, 600, 1200 or 2400 Baud. Uses Industry Standard CUTS at 300 Baud	£6.00	£20.00
PARALLEL. Two MC 6821 Parallel Interface Adaptors. One MC 6848 Programmable Interface Timer	£15.00	£50.00
ANALOG. 12 Bit Analogu and 1 byte Digital. I/O.		Available soon
PSI. System Power Supply + 5V,6A + 12V,2A −12V,1A	Assembled	£89.00

Design notes £1 per item. PRICES INC. VAT

FLEX OPERATING SYSTEM SOFTWARE ON 5" or 8" DISKS

	INC VAT
Configurable Flex with Editor & Assembler	£138.00
Debug Package	£64.40
Sort/Merge Package	£64.40
Disk Utilities	£64.40
Disk & Memory Diagnostics	£64.40
Text Processor	£64.40
68000 Cross Assembler	£230.00
Relocating Assembler/Linking Loader	£132.25
Extended Basic	£86.25
Pascal — 6809 Source Compiler	£172.50
CSC Dynocalc Advanced Spread Sheet	£161.00
STYLO Stylograph Word Processing	£230.00

Sole Distributors:

STIRLING MICROSYSTEMS

The National 6809 Centre

241 Baker Street, London NW1. Tel: 01-486 7671

Send for full specification, product details and a free price list.

TOP SAVINGS

PRINTERS – Also Available Seikosha, Oki, Star, Qume, Olivetti, TEC, Mannessman Tally.

		£
Epson	RX80	229
	RX80 F/T	256
	FX80 F/T	335
	FX100 F/T	430
Diablo	630 (RO)	1699
Smith Corona	TP1	299
Juki	6100	350
Ricoh	RP1300S	945
	RP1600S	1165
Brother	HR15	419

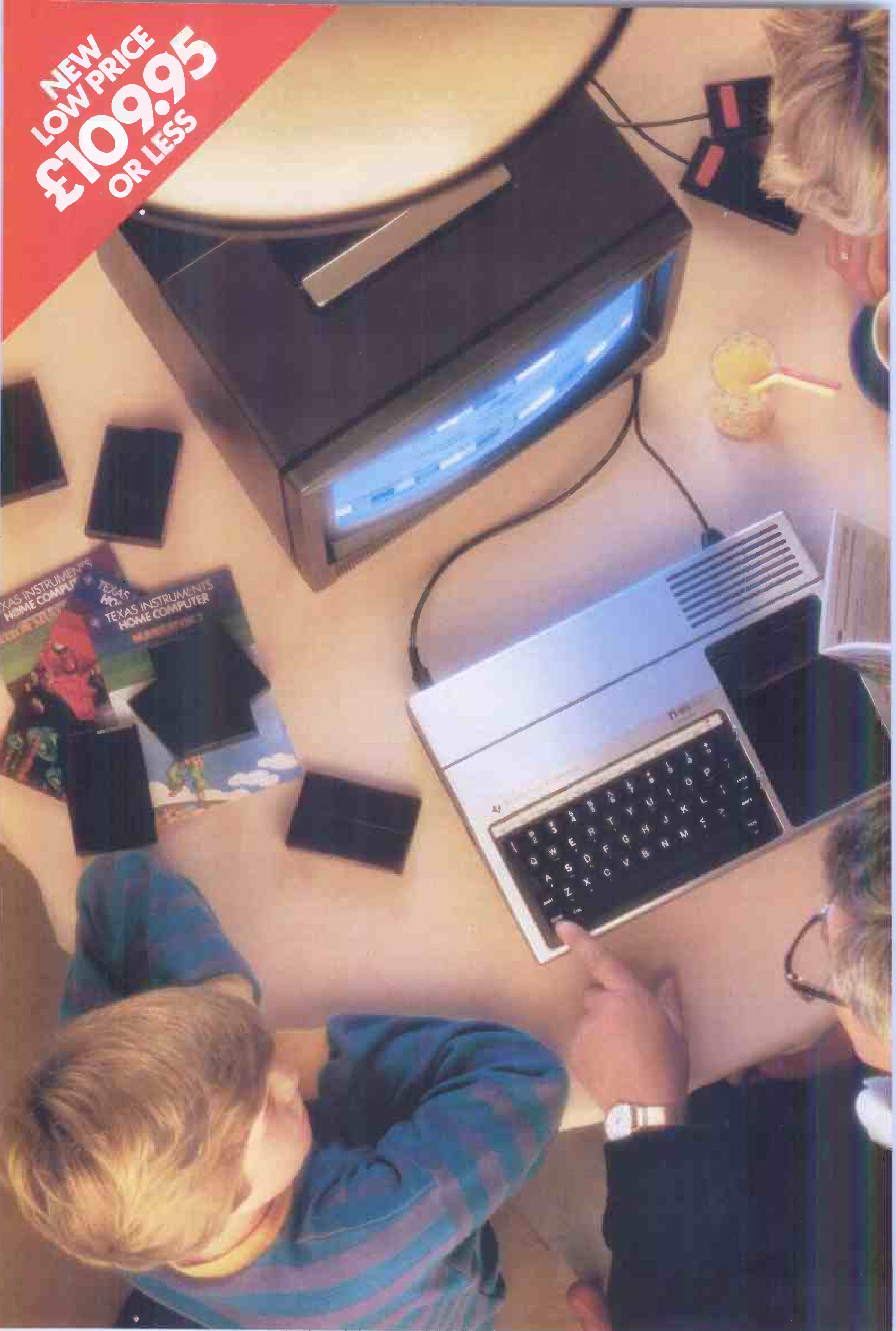
COMPUTERS

		£
Commodore	8096	735
	64	165
	1541	165
Epson	HX20	375
	QX10	1600
Spectrum	48	109

Prices exclude VAT. Next day insured delivery £10.
Monday to Friday 9.00 – 6.00.
Phone for stock availability and out of hours collection arrangements.

MAYFAIR MICROS

5th FLOOR 65 DUKE STREET LONDON W1 Telephone 629 2487


NEW
LOW PRICE
£109.95
OR LESS
TEXAS INSTRUMENTS
HOME COMPUTER

...CUMANA ANNOUNCE THE LAUNCH OF THEIR NEW DISK DRIVES FOR THE BBC AND DRAGON MICROS...

The rapidly expanding BBC and Dragon Micro markets now have top quality additions, with Cumana announcing the launch of their new disk drives to the eagerly awaiting audience of BBC and Dragon Micro users.

Cumana disk drives are designed and manufactured to the highest standards. They have an independent power supply, 12 months warranty, and are fully assembled and tested before packaging; and they are now available — at unbeatable value for money prices — from well known High Street outlets.

Look out for the distinctive Cumana packaging in your High Street today!

For further information about Cumana disk drives, please complete and return this coupon.

I am interested in Cumana disk drives for the BBC/Dragon* Microcomputer.
*delete as necessary

Interests:
Home Use ☐
Education ☐
Dealer ☐
Business ☐

Name ....
....
Address ....
....
....
Tel. No. ....
....

Note: If dealer, please attach this form to your letterheading.

CUMANA
The best name in memory

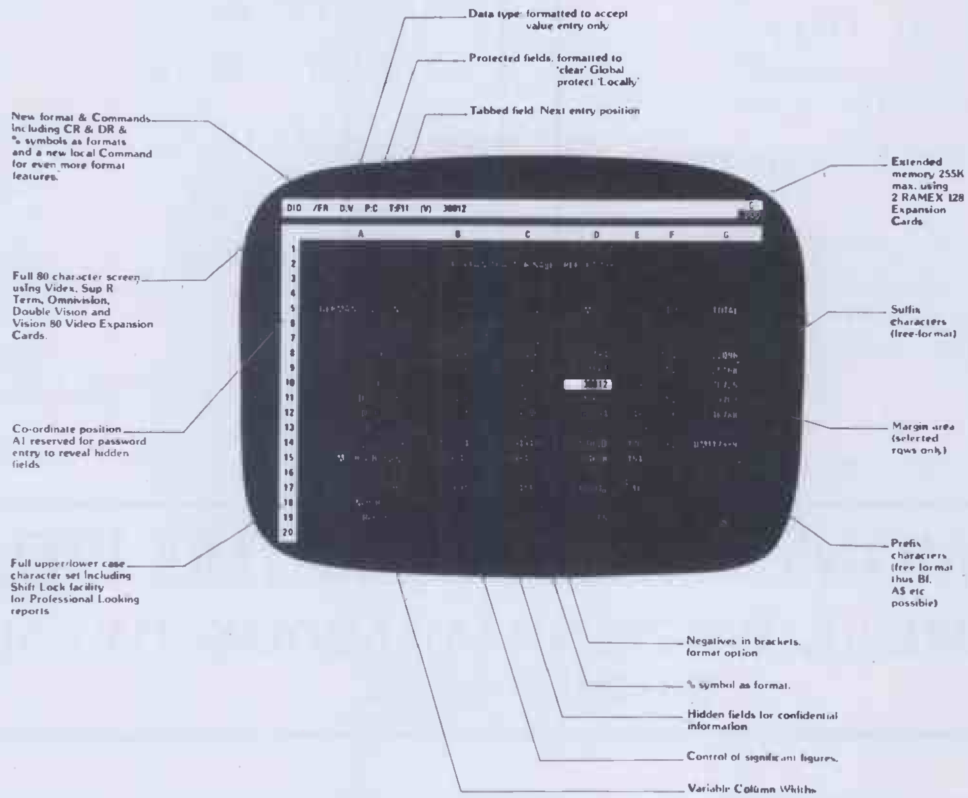
Cumana Limited, Pines Trading Estate, Broad Street, Guildford, Surrey, GU3 3BH.
Telephone: Guildford (0483) 503121 Telex: 859380

Dragon is the registered trade mark of Dragon Data Ltd   DELTA is supplied by Premier Microsystems Ltd.


Kuma
~ a unique pool of expertise
EPSON
HARDWARE PLUS
Software from the home of the Deskmaster series — the major source for HX-20 Software
SHARP
HARDWARE PLUS
A wealth of Software from the originators of Sharp approved Software for the MZ700 — also MZ80A, MZ3541 and PC1500.
SAGE
SAGE II
HARDWARE PLUS
68,000 based Forth.
commodore 64
HARDWARE PLUS
Accounts, Database and Toolkit Software
ELECTRONIC MAIL BOX
Software, advice, modems and acoustic couplers from experienced users.
NewBrain
HARDWARE PLUS
Pascal, Forth and much, much more
PRINTERS
A great range of Matrix and Daisywheel.
SIRIUS 1
HARDWARE PLUS
Kuma Forth, Mailbox and much more
PHONE NOW or SEND FOR DETAILS
MAIDENHEAD (0628) 71778
Kuma Computers Ltd
11, York Road, Maidenhead, Berks SL6 1SQ
Telex 849462 TELFAC KUMA
COMET: KUMA
TELECOM GOLD: KUM ØØ1
Please tick box for information required, and send coupon to:
Kuma Computers, Ltd. 11 York Road, Maidenhead, Berks SL6 1SQ
Hardware Software Hardware Software
SIRIUS
SAGE
SHARP 700
SHARP A
SHARP 3541
SHARP PC1500
EPSON HX-20
EPSON QX-10
NEWBRAIN
COMMODORE 64
ELECTRONIC MAILBOX
PRINTERS
NAME
ADDRESS
POST CODE

CONGRATULATIONS

Your Visicalc™ Just Doubled in Value



Super Expander 80·2 keeps all your existing Visicalc™ facilities and adds all the commands you have been waiting for, like Variable Column Widths, Tabbed Fields, Protected Fields, Password Protection and a whole series of advanced format features which are shown on the Visicalc™ sheet above prepared with Super Expander 80·2.

The Super Expander 80·2 requires the Vergecourt Ramex 128K expansion card to be installed in your Apple II Plus or Apple IIe system and increases your Visicalc™ storage to 136K and automatically supports your favorite 80 Column Cards (if fitted) including the new Apple IIe 80 Col Card and its cursor keys. However, if you are an advanced Visicalc™ user up to two Ramex 128K Boards can be installed in your Apple System to achieve a massive 255K Working Model. Worksheets are saved to disk in a maximum of 20 seconds for 136K and 45 seconds for 255K (2 disks).

There's simply No other memory expansion/software combination that even comes close. All others give you less memory, take longer to Load & Save (as much as fifteen minutes longer), and cost you More for Less. You've got to see it to believe it. Quick! call your dealer.

Ramex 128 Expansion Card £295.00

Super Expander 80·2 £80.00

SUPER EXPANDER 80·2

Upgrade your existing Super Expander 40 or 80 for the price difference only

Apple II is the trademark of Apple Computers Inc   Visicalc is the trademark of Visicorp

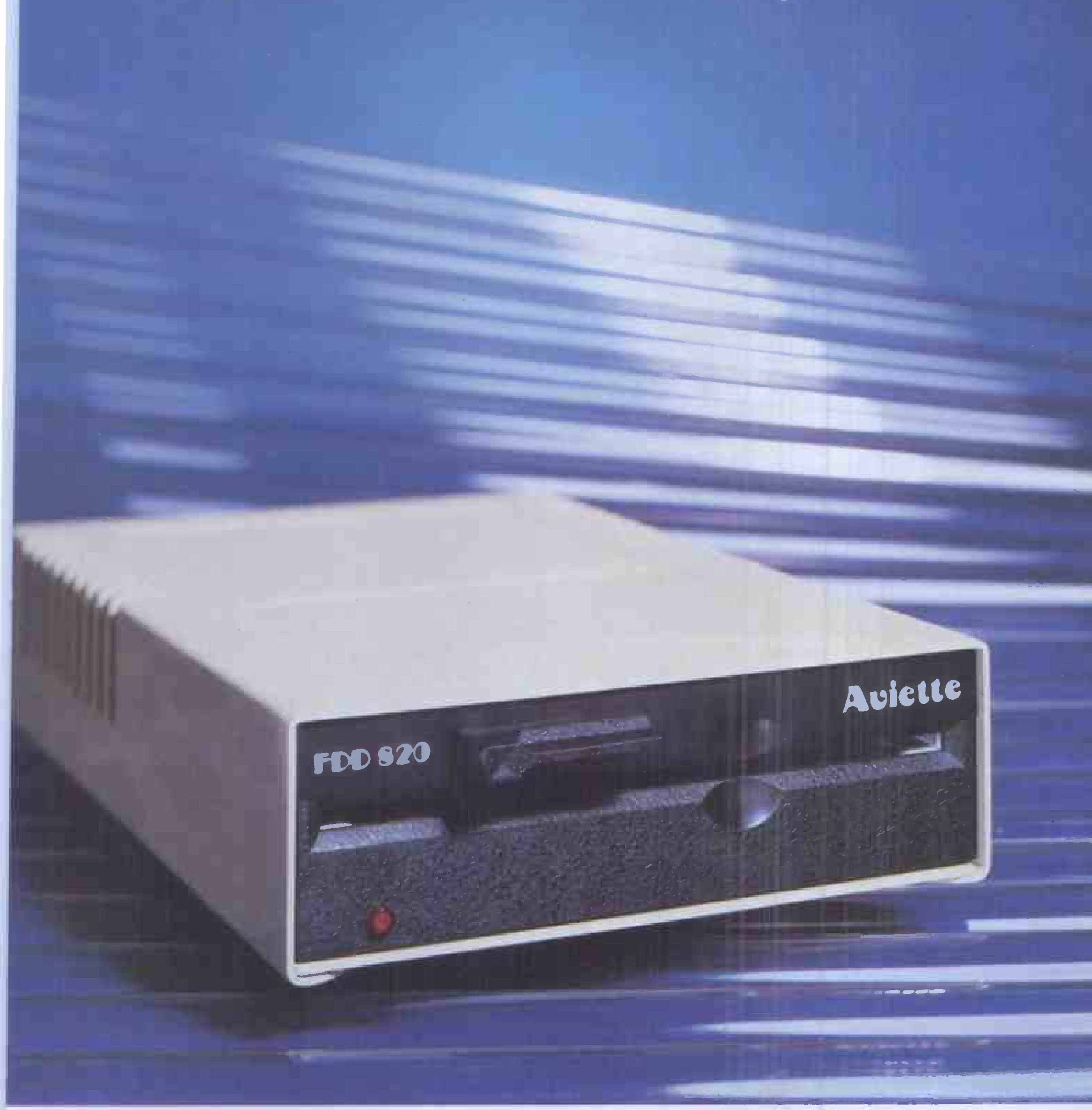
VERGECOURT LTD

Lyndean House
Queens Road
Brighton
East Sussex

Tel: (0273) 728551
Telex 877083 Vergct

Generous Dealer/Distributor Discounts

Add a little sweetener for your Apple®
The Aviette 820 from Tashkl at only £192 + VAT



- **Fully compatible with Apple & Apple compatibles**
- **No noise**
- **Compact size (slimline)**
- **Instant installation**
- **Software transparent**
- **High precision positioning**
- **Patterned switch**

Dealer enquiries welcome

TASHKL COMPUTER SYSTEMS LTD
24 Logan Road, Wembley,
Middlesex HA9 8PX
Tel: 01-904 4467. Telex: 296708

Tashkl's 5¼-inch disk drive AVIETTE FDD-820 will mate your Apple II® computer system perfectly in quality and function but at less cost to you. The track format and storage capacity of your AVIETTE FDD-820 are identical to those of Apple II®'s disk drive. There's no need of resectoring or software modification to existing programs. AVIETTE FDD-820 can easily fit in Drive 1 thru Drive 6 on either an Apple or Apple compatible disk interface card.

AVIETTE FDD-820 is engineered and built to the most demanding industrial standards of reliability, availability and maintainability. With a mechanism so super that all I/O errors are virtually eliminated. Passing thru the crucial 72 hours of burning-in test, you can be sure of its reliability. When you own an AVIETTE FDD-820, your Apple is sweetened.

For further information, please contact us today. International Dealer/Distributor wanted.


WHATEVER HAPPENS
IN THE FUTURE, IT'LL
FIT INTO THIS SPACE.
COPY
FOR
NEXT
O
P
POINT
L
POKE
PEEK
VAL
RTN
MATTEL ELECTRONICS®
AQUARIUS™
Microsoft™ BASIC is a trademark owned by and used under license from Microsoft Inc.

Dectrade
for Personal Computers, Micros & Dec Based Systems

WE BUY, SELL AND TRADE BACK NEW AND USED DEC

Consult us also for **ALL DEC SYSTEMS**

From personal computers to large business systems.
Single/Multi User.
Free Standing or Table Top.
Configured with disks and tapes of your choice.

MICROS, PRINTERS, VDU's

We are one of the largest suppliers in the UK.
Micros: Globe, Superbrain, Cifer, Altos.
Printers, DEC, DRE, Tally, Data Products, OKI, Epson, Star.
VDU's: DEC, M3000 colour, Tubestar, Haseltine Esprit.

"Basics"
(Dectrade Ltd)
for Home Computers

BBC, SPECTRUM, DRAGON

All models and peripherals in stock of these popular home computers.
Educational and Financial Software and Games available.
Top Ten Games now in stock.

MONITORS — TV

Monitors: Colour and green screen.
Colour Monitors: — TV: All TV channels plus RGB input for computers.

THIS MONTH'S SPECIAL SALE

Texas Aram OMC Commodore plus software and games.
Contact "Basics" for that special deal.

"Basics"
The Midlands Shop with the Nationwide Service
Trent Boulevard, Nottingham
Tel: 0602 819713 Telex 377678 NETWRK

Dectrade Ltd
Network House, 20 Ludlow Hill Road, West Bridgford, Nottingham NG2 6HF
Tel: 0602 235141 Telex: 377678 NETWRK

Moore on Kuma

Account on Kuma

Kumacount business application software for the Sharp 3541 has now been launched.

Kumacount 1 is aimed at the retailer and covers every aspect of trading. A sales segment records takings, receives stock, checks understocked items and automatically updates stock.

Other segments include a 'management' which details stock values, mark ups, and individual item sales data; and a purchase segment covering all eventualities in stock purchases and expenses, with a separate vat segment.

Kumacount 2 is an accounts and incomplete records system for the small business. It automatically handles all postings, producing an opening trial balance through to profit and loss account and balance sheet.

Accounts automatically created and updated are: sales ledger control; purchase ledger control, discount, purchases, sales, cash book, vat, profit and loss, and balance sheet.

Both Kuma programs cost £395 plus vat and are immediately usable and easy to follow.

Sweet 16-Bit

Here's your chance to get "inside" a 68000 at a realistic price — with Kuma's new development system at only £295 plus vat.

On an A5 sized board we have designed a 68000 system that can be used for hardware preprocessing, software development, laboratory experimentation, or simply finding out what a 68000 can do. It's also an ideal OEM product.

Features include 68000 processor (of course!), 10MHz clock, 4K static RAM, 24 PIO channels and a separate EPROM blower that will hold up to 16K, is available for £95 plus VAT.

Our 68000 board can be accessed via a RS232C link to any external 40 or 80 column terminal. There is a monitor ROM that "wakes" the board up to machine code, and a bus capable of supporting up to 4MB of memory.

An interesting feature of the board is that it can blow an EPROM which may then be plugged into the optional EPROM board and tried out — a sort of instant heal thyself package.

NewBrain lives on at Kuma

Although at the time of publication the fate of Grundy/NewBrain was uncertain, Kuma still cherishes its NewBrain customer base and will continue to publish software for the machine. We shall not desert it or you.

Have a sharp Peek and Poke

MZ711 users who like peeking and poking, can now do it safely with the help of that well known author G.P. Ridley.

GPR has written a guide specially for you called "Peeking and Poking the MZ711" which is available from Kuma at £5.95.

Software Catalogues

Our FREE autumn software catalogues for Sharp MZ80A & K, Epson HX-20 and Sharp MZ711 are yours for the cost of a phone call — ring Kuma on (0628) 71778 and place your order.

Good news time

Because we now have the super CP/M for the Sharp 3541, which gives greater disk capacity (375K per drive) and compatibility with the MZ80B.

And a BASIC compiler for the MZ700 and 80A & K at the ridiculously low price of £14.50 incl. VAT.

And a RS232C interface with 2 ports for the MZ700 at £79.95 incl. vat. (Hi-res graphics coming soon!)

And a Pascal Compiler at £39.50 plus vat for the Epson HX-20.

Hard Centre

While Kuma goes softer and softer, it should not be forgotten that we have a thriving hardware side selling machines, printers of all shapes and sizes, plus a host of standard and not-so-standard interfaces. (Ring (0628) 71778 and be pleasantly surprised.)

Please tick box ☑ for information required, and send coupon to:
Kuma Computers, Ltd. 11 York Road, Maidenhead, Berks SL6 1SQ

Hardware	Software	Hardware	Software
☐ SIRIUS	☐	☐ EPSON HX-20	☐
☐ SAGE	☐	☐ EPSON QX-10	☐
☐ SHARP 700	☐	☐ NEWBRAIN	☐
☐ SHARP A	☐	☐ COMMODORE 64	☐
☐ SHARP 3541	☐	☐ ELECTRONIC MAILBOX	☐
☐ SHARP PC1500	☐	☐ PRINTERS	☐

NAME ....

ADDRESS ....

.... POST CODE ....

OPUS DESKING
FOR BUSINESS SYTEMS

MODEL 5

- ★ Made in Britain
- ★ Scratch resistant surfaces
- ★ Competitive prices
- ★ Drawer for disc storage
- ★ Castors with lockable brakes
- ★ Attractive brown and cream finish
- ★ Generous desk top area
- ★ 10 models available
- ★ Lower shelf for disc drives
- ★ Ex-stock delivery

OPUS SUPPLIES

01-701-8668 01--703-6155
158 CAMBERWELL ROAD
LONDON SE5 0EE.

DEALER ENQUIRIES INVITED

GOVT & EDUCATIONAL ORDERS WELCOME

SWITCH ON!!
To our RS232
SWITCH BOX

Lets 2/3 VDU's share one printer or word processor, etc

2 Way Switch **£79.95** + VAT *3 Way Switch* **£99.95**

- * 25 lines switched.
- * Fully inspected and tested.
- * Guaranteed for 12 months.
- * Immediate delivery, carriage paid.

HOMESTEAD ELECTRONICS
24, OXFORD RD., DENHAM,
UXBRIDGE, MIDDLESEX.
Phone (0895) 832375 (24hrs)

We welcome Access

SIMON CARD

Simon makes it Simple!

Simple for you to buy quality British boards at excitingly low prices, with guaranteed fast delivery, backed by a full years warranty.

IBM PC

RAM boards with Asynchronous Serial Port
All boards expandable to 256K

64K +	£180
128K +	£220
192K +	£265
256K +	£305

SIRIUS/VICTOR

128K RAM (not expandable)	£175
128K RAM (expandable to 384K)	£210
256K RAM (expandable to 384K)	£280
384K RAM	£355

TIMEKEEPER/CLOCKBOARD
with back-up battery
£99

REGISTERED PRODUCT

apple®][&][e
Aristocards

Interfaces complete with 4ft cable & connector

Graphics Interface £69 Parallel Interface £64
Serial Interface £69 68000 processor board £320

ALL OF THE ABOVE BOARDS ARE OF THE HIGHEST QUALITY MADE WITH THE VERY BEST COMPONENTS. THEY COME WITH COMPREHENSIVE MANUALS FOR EASY AND SAFE INSTALLATION

ALL PRICES QUOTED IN POUNDS STERLING AND EXCLUSIVE OF VAT & P + P.

NOW AVAILABLE EX-STOCK AT LOW PRICES
64K DRAM (150ns)
25+ £3.50 each – 100+ £3.25 each

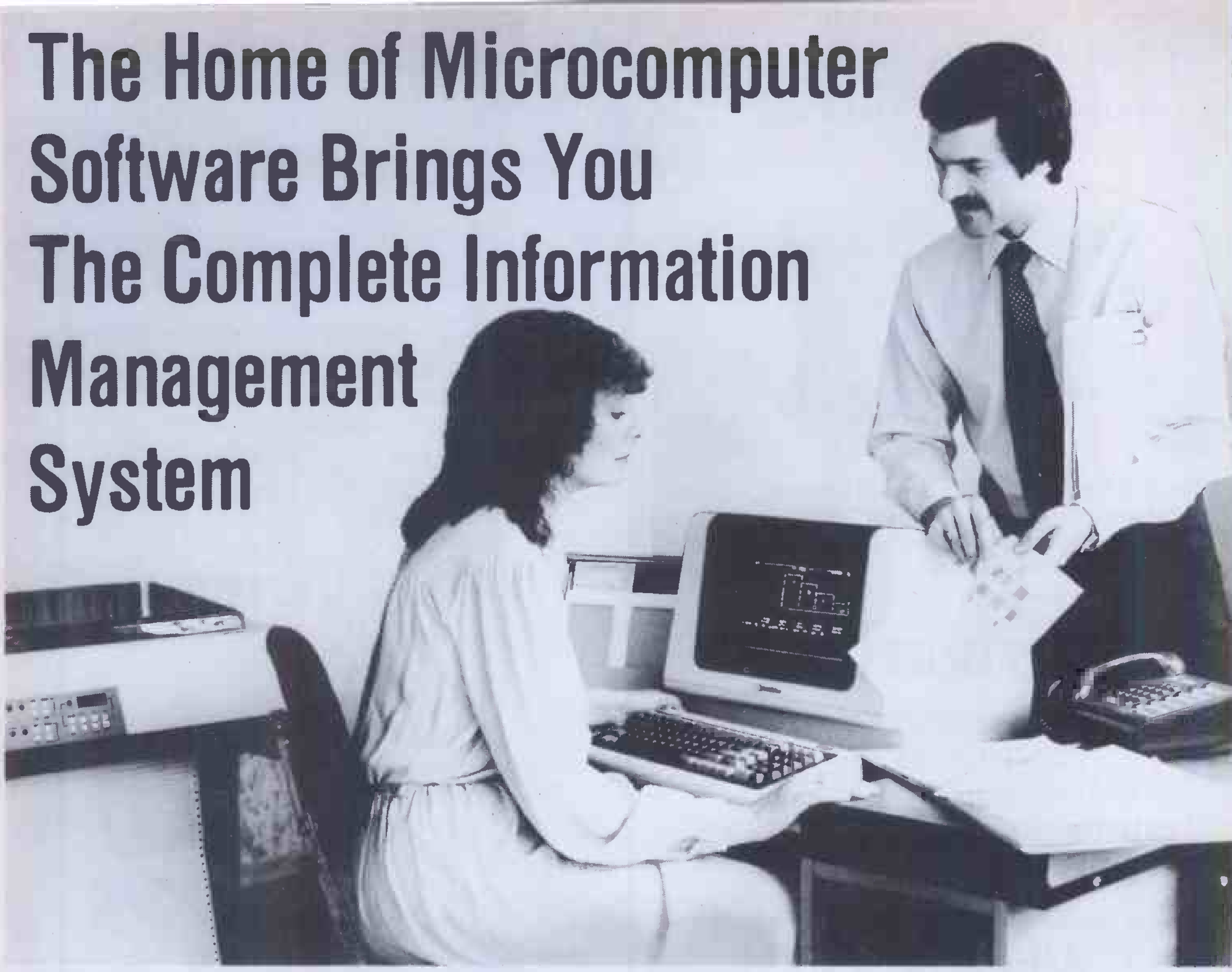
GENEROUS DEALER DISCOUNTS AVAILABLE ON ALL BOARDS

SIMON CARD

SIMON COMPUTERS LIMITED
28 Lower Addiscombe Road
Croydon
Surrey CR0 6AA
England
Tel 01-680 4646

DESIGNERS AND SUPPLIERS OF QUALITY MICROCOMPUTER BOARDS

The Home of Microcomputer Software Brings You The Complete Information Management System



QUICKCODE ™

The dBASE II Program Generator

Generate a customer database in 5 minutes with QUICKCODE, the dBASE II program generator. It's that simple. Absolutely the most powerful program generator you've ever seen. And the easiest to use.

dUTIL ™

The dBASE II Utility Program

dUTIL is Fox & Geller's utility program for dBASE II. dUTIL decreases the running time of dBASE II command files. dUTIL combines your command files automatically to produce a faster running time.

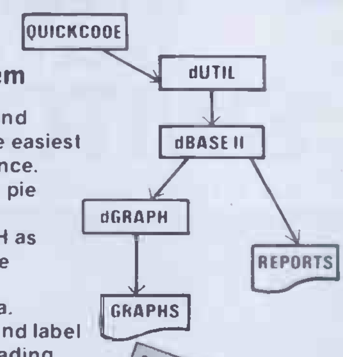
dBASE II ™

The Relational Database

dBASE II is what database management is all about.
It's an information-handler, not a file handler.
It's relational, not hierarchal, so you don't have to get involved with sets, lists, pointers and all the other complexities still around from the 1960's.
It's interactive so that data entry is easy.
It can be programmed so that even untrained personnel can accurately run even your most complicated applications.
It gives you full X-Y control so that input and output are done the way you want them done, even on your existing forms.
It has a full English-like language of its own so it's easy to use, with structures that make it easier to use right.
Changing, extending, modifying of databases take a few simple commands.
And the documentation is so thorough that it's almost a mini-course in database management.

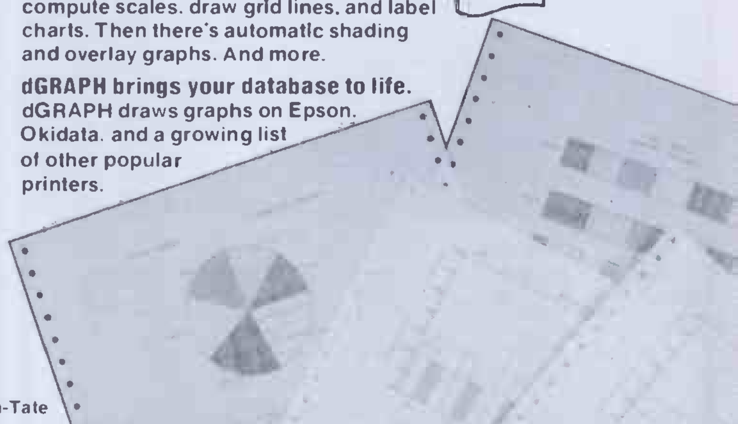
dGRAPH ™

The dBASE II Graphics System



Now you can combine database and graphics. With dGRAPH by far the easiest to use graphics package in existence. Just press one key and you've got pie charts, bar graphs, or line graphs. Advanced features make dGRAPH as powerful as it is easy. Features like AUTOGRAPH which will **automatically** load dBASE II data, compute scales, draw grid lines, and label charts. Then there's automatic shading and overlay graphs. And more.

dGRAPH brings your database to life.
dGRAPH draws graphs on Epson, Okidata, and a growing list of other popular printers.



MPI

MICROCOMPUTER PRODUCTS INTERNATIONAL LIMITED

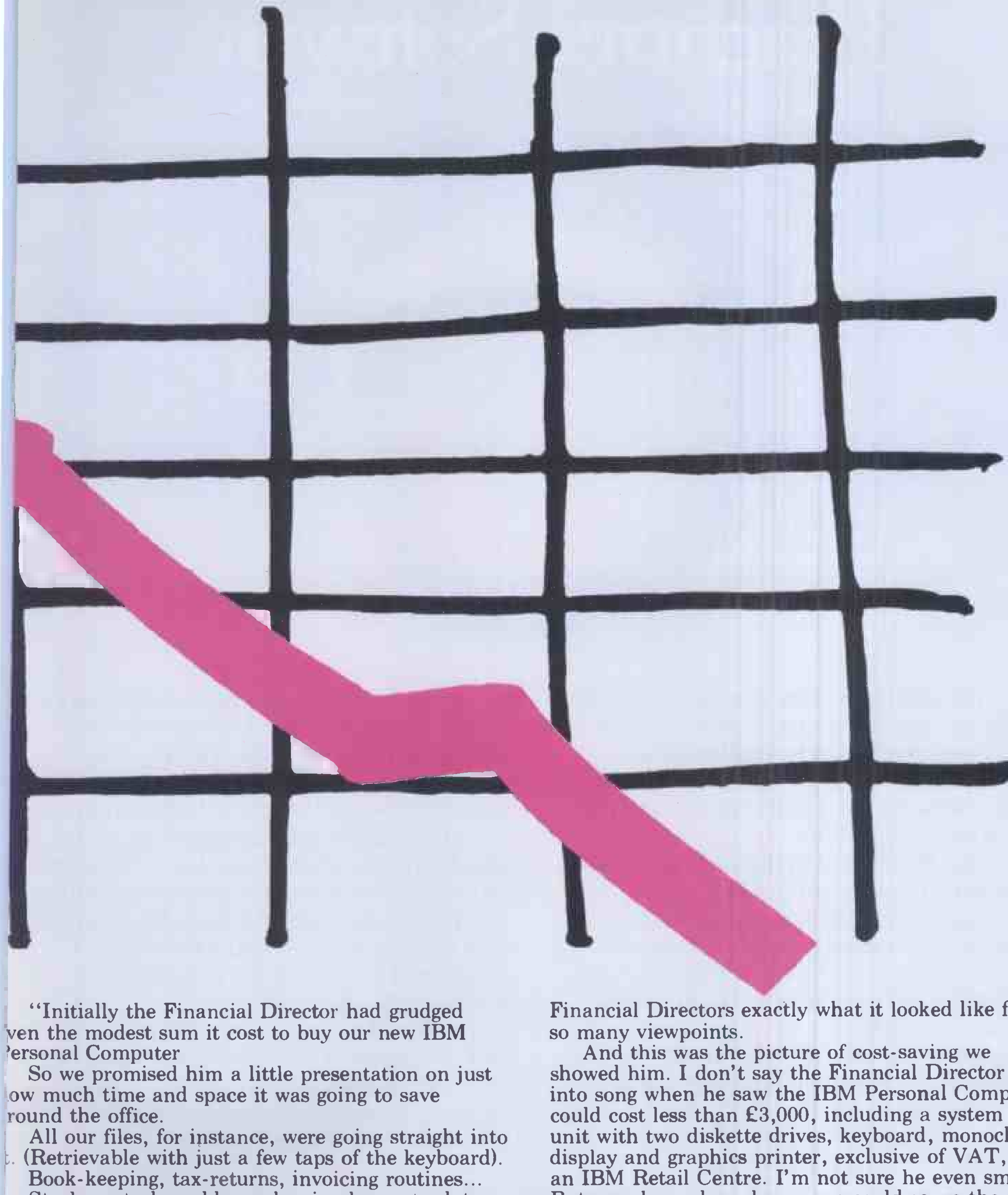
THE HOME OF MICROCOMPUTER SOFTWARE

Central House,
Cambridge Road,
Barking,
Essex IG11 8NT.

Tel: 01-591 65
Telex: 892395


THE FIRST THING
WE HAD IT FIGURE OUT
WAS HOW SOON
IT WAS GOING TO PAY
FOR ITSELF.

GGK



THE OS

EXTRA

EXTRA SOFTWARE, EXTI

More good news as Osborne leads the way yet again with a sensational new software extra. Two leading programs – Personal Pearl and Peachtree Budget Office Accounting System – together worth over £600.00 come free when you bu either of the following systems.

THE OSBORNE 1 BUDGET OFFICE SYSTEM

The Osborne 01 delivered with five outstanding software programs Ready-to-go –

Supercalc: Electronic spreadsheet
C Basic: Programming language
M Basic: Programming language
Wordstar: Word processing with Mailme
CP/M: Operating system

As well as giving you **Personal Pearl** **Peachtree** Business Management syst Osborne include **STARTPAC** in the 01 Budget Office System. This self-instruction guide will enable you to get to work with yo Osborne straight away!

Osborne offer you the 01 Budget Off System for only £1495.00. A saving of ne **£600.00.**

3ORNE

EXTRA

LIMITED OFFER

CAPACITY, EXTRA VALUE.

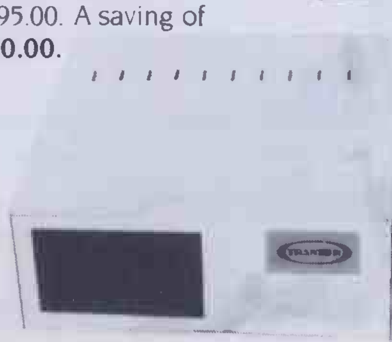
THE OSBORNE 1 EXTRA STORAGE SYSTEM.

The proven Osborne 01 and the Trantor 5MB
rd disk offer the storage capacity of more than
times that of a floppy disk. And up to 5 times
ster system performance. The Extra Storage
stem transforms the 01 Portable Business
mputer into a powerful office system which
atches the storage, speed, convenience and
exibility of desk top systems costing twice
e price. **Personal Pearl** extends the power
your Osborne for information handling
sks previously reserved for larger systems.

Installation is easy – simply unpack your
isk, plug it into your Osborne 1 and run a simple
stallation procedure

The Osborne 01 with Trantor
MB hard disk system together
ith **Personal Pearl** and
eachtree Business
anagement System costs
nly £2995.00. A saving of
er **£800.00.**

£2995 +VAT



Take the lead from Osborne
and telephone the Osborne Sales Department
now for details of your local authorised Osborne Dealer

Tel: (0908) 615274

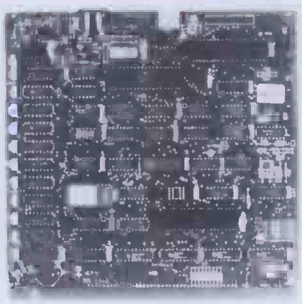
The Osborne Computer Corporation (UK) Ltd. 38 Tanners Drive,
Blakelands North, Milton Keynes, MK14 5LL, Bucks. Telex: 825220.

OSBORNE

COMPUTER CORPORATION

Someone has to lead the way

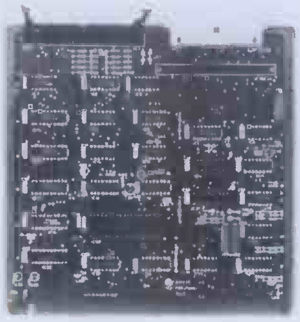
MicroValue 80-BUS MULTIBOARDS



GM813—CPU/64K RAM Board

* 4MHz Z80A C.P.U.
* 64K Dynamic RAM
* RS232 Interface
* Two 8-Bit I/O Ports
* Cassette Interface
* Extended & Page Addressing Modes
* CP/M Compatible Monitor

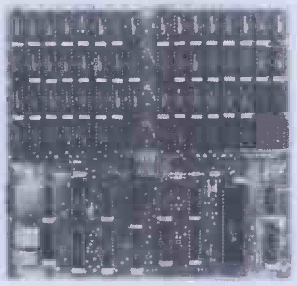
£225



GM829—Disk Controller Board

* Up To 4 Mixed 5.25 & 8" Drives
* SASI Hard Disk Interface
* Single & Double Density Operation
* Single & Double Sided Drive Support
* Supports 48 and 96 TPI Drives

£145

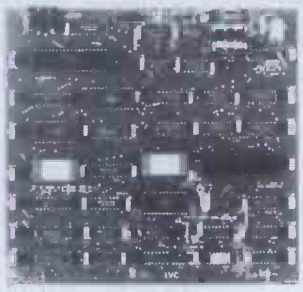


GM833—RAM-DISK Board

* Virtual Disk Operation
* 512K Dynamic RAM
* Port Mapped For Easy Interface Software
* Over 10 Times Faster Than a Floppy Disk

£450

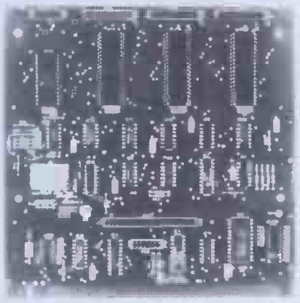
Please note: This board cannot be used as a conventional RAM board



GM812—Video Controller Board

* 80 Characters×25 Line Display Format
* On-board Z80A Microprocessor
* Buffered Keyboard Input
* Programmable Character Generator
* 160×75 Pixel Graphics
* Light Pen Input

£125



GM816—Multi I/O Board

* 6 I/O Ports
* 4 Counter/Timer Channels
* On-Board Real Time Clock
* Battery Backup
* Further Expansion Capability

£125

PLUTO—Colour Graphics Board

* On-Board 16 Bit Microprocessor
* 640×576 Bit Mapped Display
* 192K Of Dual Ported RAM
* Comprehensive On-Board Software

£399

CLIMAX—Colour Graphics Board

* 256×256 Pixel Display
* 16 Colours
* Ultra-fast Vector & Character Generation
* Light Pen Input
* UHF or RGB Outputs

UHF Version **£199**

UHF & RGB Version **£220**

GM811—CPU Board

* 4MHz Z80A CPU
* 4 'Bytewide' Memory Sockets
* 2x8-Bit Input/Output Ports
* 8 Bit Input Port
* RS232 Serial Interface
* Cassette Recorder Interface

£125

GM803—EPROM/ROM Board

* Up to 40K of Firmware
* 2708 or 2716 EPROMS
* Page Mode Operations

£65

GM802—64K RAM Board

* 64K Dynamic RAM
* 4MHz Operation
* RAM Disable Function
* Page Mode Operation

£125

MP826—Static RAM Board

* 32K Static RAM
* Battery Backup
* Page Mode Operation

£185

EV814—IEEE488 (GPIB) Controller

* Cost Effective Controller
* Comprehensive Software Supplied
* Full Implementation
* Easy To Use

£140

GM827—87 Key Keyboard

* User Definable Function Keys
* Numeric Keypad
* Cursor Control Keys

£85

GM839—Prototyping Board

* Fibreglass P.C.B.
* 80-BUS Signal Identification
* High Density IC Capability

£12.50

All the boards and components in the 80-BUS range are fully compatible and offer a very flexible and cost effective solution to your computer needs. For further information about the 80-BUS range contact your nearest MICROVALUE dealer.

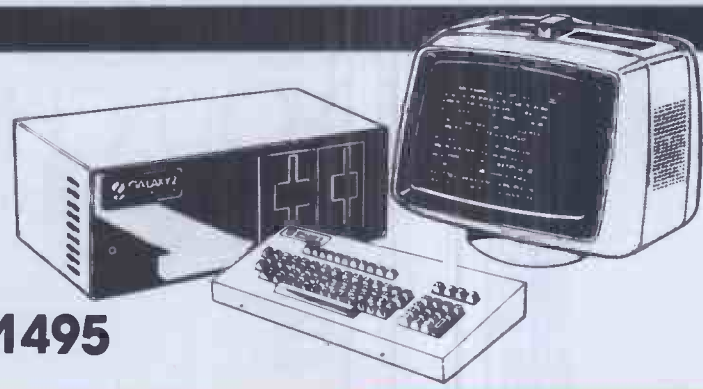
MicroValue - MicroValue

COMPUTERS

Gemini Galaxy 2

"I would place the Galaxy at the top of my list"
(Computing Today, April 1983)

- ★Twin Z80A Processors
- ★CP/M 2.2 Operating System
- ★64K Dynamic RAM
- ★800K Disk Capacity
- ★80x25 Video Display
- ★Serial and parallel printer interfaces
- ★Cassette and light pen interfaces
- ★User definable function keys
- ★Numeric key pad
- ★12" Monitor included

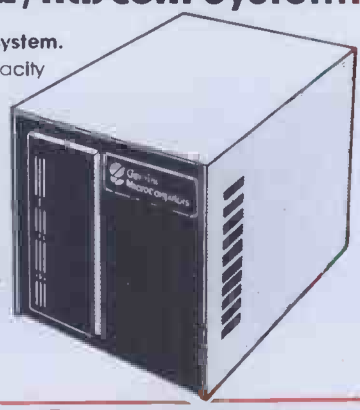


£1495

At last—a Winchester Drive for your Gemini/nascom System!

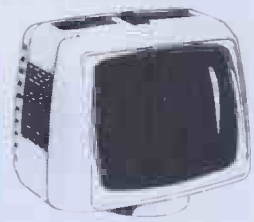
GM835 Winchester Drive Sub-system.

- ★5.4 Megabyte Formatted Capacity
- ★Rodime Drive
- ★Industry Standard SASI interface
- ★Integral Controller and power supply



£1450

Phoenix P12 Monitor



A high quality data display monitor, ideal for all Nascom and Gemini systems. 20MHz resolution. Available in amber or green phosphor.

£110

Disk System for Gemini & nascom

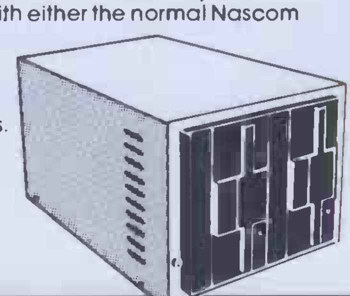
GM825 Disk Drive Unit – The GM825 floppy disk housing is supplied with either one or two 5.25" single sided, double density, 96TPI high capacity Micropolis 1015F5 disk drives. These provide 400K bytes of formatted storage per drive. (Gemini QDSS format). The CP/M2.2 package available supports on-screen editing with either the normal Nascom or Gemini IVC screens, parallel or serial printers.
An optional alternative to CP/M is available for Nascom owners wishing to support existing software.
Called POLYDOS 4, it includes an editor and assembler and extends the Nascom BASIC to include disk commands.

Single Drive System GM825-1S **£350**

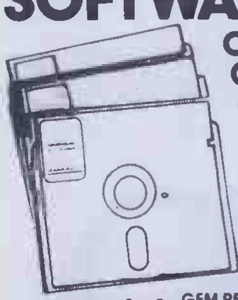
CP/M2.2 Package (GM 532 for Gemini) **£90**

POLYDOS 4 for Nascom **£90**

Dual Drive System GM825-2S **£575**



SOFTWARE



CP/M Software Compas

is totally different from other compiler based Pascal systems, as it allows you to create, edit, run, and debug Pascal programs in a highly interactive manner.

£120

'The Last One'

is used in conjunction with Microsoft's MBASIC*. No knowledge of BASIC programming is required since all input is performed using question and answer routines written in plain English.

£330

*MBASIC—MicroValue Price if purchased with 'The Last One' —**£178.95 inc.VAT**

Gemini Software:

(All prices ex-VAT).

GEM PEN Text Editor	£45
GEM ZAP Assembler	£45
GEM DEBUG Debugging Utility	£30
WORDSTAR Word Processor	£295
GEM GRAPHIC Links with MBASIC	£35

BUY FROM THE COMPUTER PROFESSIONALS

MICROVALUE DEALERS:

AMERSHAM, BUCKS
Amersham Computer Centre,
18 Woodside Road,
Tel: (02403) 22307

BRISTOL
Target Electronics Ltd., 16 Cherry Lane.
Tel: (0272) 421196

EGHAM, SURREY
Electrovalue Ltd.,
28 St. Judes Road, Englefield Green.
Tel: (07843) 3603

IPSWICH
MDW (Electronics),
47/49 Woodbridge Road East.
Tel: (0473) 78295

LEEDS
Bits & PC's, Leeds Computer Centre,
62 The Balcony, Merrion Centre,
Tel: (0532) 45887

LONDON W2
Henry's Radio, 404 Edgware Road.
Tel: 01-402 6822

LONDON SW11
OFF Records,
Computer House, 58 Battersea Rise,
Clapham Junction.
Tel: 01-223 7730

MANCHESTER M19
EV Computing, 700 Burnage Lane.
Tel: 061-431 4866

NOTTINGHAM
Computerama, (Skytronics Ltd.)
357 Derby Road.
Tel: (0602) 781742

Telephone orders welcome

MicroValue

REAL value — from the Professionals

● Circle No. 177

WHICH OF THESE TWO TOP PORTABLE COMPUTERS WILL YOU CHOOSE?

OSBORNE	KAYPRO II
5″ monitor	9″ monitor
200K or 400K storage	400K or 800K storage
No Winchester	Winchester disk available
2 free software packages	5 free software packages and 10 games
Plastic case	Metal case

CK Computers Limited. Telephone: (0934) 516246/(0752) 780311

The Kaypro II features should make the choosing easy. If you're interested in finding out all about this ultra-reliable, top selling U.S. system, call us today. Kaypro II. Powerful, portable, affordable.

Please send me full details of the Kaypro systems.

Name

Address

Telephone

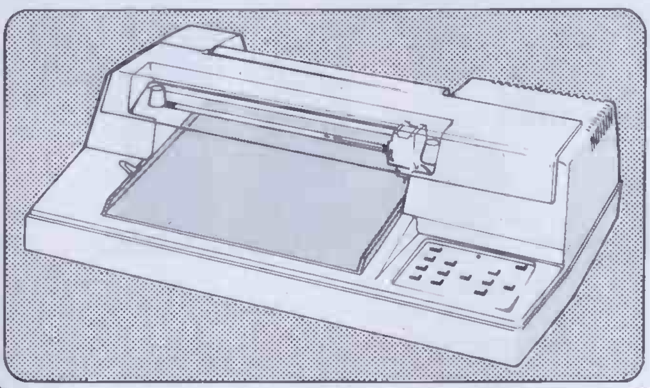
Sales Enquiries: (0934) 516246
CK Computers Ltd.
6 Devonia House
High Street
Worle
Weston-super-Mare
Avon
Also at: (0752) 780311. Telex: 45786

CK Computers Limited

watch out for data warrior

Data Warrior are proud to announce the launch of their new product range which includes the highly acclaimed Hewlett-Packard 7470A Plotter. The only one with "Sweet-Lips" technology.

HEWLETT-PACKARD

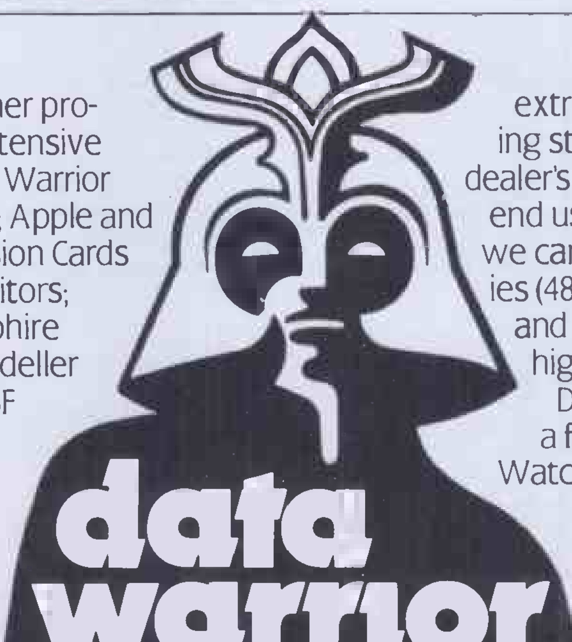


7470A PLOTTER

Despite the myriad imitations, the 7470A Plotter is the **only** one with "Sweet-Lips" technology. It's interesting to see other plotters producing what appears to be a similar output to the 7470A, but if accuracy in dimensions is important to you, then you'll find that few if any can match the Hewlett-Packard expertise. The HP 7470A can plot 1000 points in a 1-inch line! With that degree of resolution coupled with the capability to run almost all popular micros, and the back-up and experience of one of the world's largest manufacturers, you can't afford to sell lesser machines.

There are many other products available in our extensive range and these include Warrior 10 System for IBM; Sirius; Apple and S100 BUS; Digitek Expansion Cards for Apples; Phoenix Monitors; Centronics Printers; Sapphire Mars – CP/M Financial Modeller and a wide range of BASF Floppy discs.

We have an extremely competitive pricing structure which includes dealer's stocking finance and end user leasing. What's more we can offer very fast deliveries (48 hours in most cases) and a comprehensive and highly geared organisation. Data Warrior will soon be a force to be reckoned with. Watch out for Data Warrior.



This advertisement shows only a small part of our range. For complete details please complete the coupon or telephone:

Name ______ Position ______

Company ______

Address ______

Data Warrior, Adelaide House, 9 Adelaide Street, St Albans, Herts AL3 5BE.
Telephone: St Albans (0727) 37327.

WEST COUNTRY

Avon Business Computers Ltd.,
192 Wells Road, Bristol, Avon BS4 2AX.
Tel: 0272 779452/3.
MOS Computers,
11 Portland Square, Bristol, Avon BS2 8ST.
Tel: 0272 421486.
AC Systems,
6 Cathedral Lane, Truro, Cornwall TR1 2QS.
Tel: 0872 79727.
AC Systems,
13 Heavitree Road, Exeter, Devon EX1 2LD.
Tel: 0392 211718.
AC Systems,
75 Mutely Plain, Plymouth, Devon PL4 7DS.
Tel. 0752 260861.
Devon Computers (North),
Seven Brethren Bank, Barnstaple,
Devon EX31 2AS. Tel: 0271 74478.
Devon Computers,
The White House, 39 Totnes Road, Paignton,
Devon TQ4 5LA. Tel: 0803 526303.
JAD Integrated Services (Plymouth) Ltd.,
32 Western Approach, City Centre, Plymouth,
Devon PL1 1TQ. Tel: 0752 29038/662616.

Business Electronics Ltd.,
Rownhams House, Rownhams,
Southampton, Hampshire SO1 8AH.
Tel: 0703 738248/739092 (Sales).
(Also Micro majic in Plummers).
Computerstore Ltd.,
9-11 Richmond Hill, Bournemouth,
Dorset BH2 6HE. Tel: 0202 296963.
Ferranti & Craig Ltd.,
Basingstoke Computer Centre,
5 New Market Square, Basingstoke,
Hants. RG23 1JA. Tel: 0256 52203/69750.
Microchips,
46-48 St. Georges Street, Winchester,
Hants. SO23 8BE. Tel: 0962 68085.
Alpha Business Systems Ltd.,
Electron House, Church Street,
Ware SG12 9ES. Tel: 0920 68926/7.
Photo Acoustics Ltd.,
255A St. Albans Road (Entrance in Judge
Street), Watford, Herts. WD2 5BQ.
Tel: 0923 40698.
The Computer Room,
87 High Street, Tonbridge, Kent TN9 1RX
Tel: 0732 355962.

WEST/CENTRAL LONDON

Adda Computers Ltd.,
Unit 8, 1 Broomfield Road, West Ealing,
London W13 9AP. Tel: 01-579 5845/5848.
Capital Computer Systems Ltd.,
32 Windmill Street, London W1P 1HH.
Tel: 01-636 3863.

GREATER LONDON/MIDDLESEX

L & J Computers,
192 Honeypot Lane, Queensbury, Stanmore,
Middlesex HA7 1EE. Tel: 01-204 7525.

EAST ANGLIA

Arden Data Processing,
166 Park Road, Peterborough, Cambs. PE1 2UF.
Tel: 0733 47767.

MIDLANDS

SWW Computer Systems,
Ketwell House, 75-79 Tavistock Street,
Bedford, Bedfordshire MK40 2RR.
Tel: 0234 40601.
Davidson-Richards Ltd.,
29 Charnwood Street, Derby,
Derbyshire DE1 2GU. Tel: 0332 683231.
AOM Business Systems Ltd.,
Scotia House, 6 Highfield Street,
Leicester LE2 1AB. Tel: 0533 542845.
The Computer Supermarket Ltd.,
Unit 8, Southfolds Road, Oakley Hay Ind. Est.,
Corby, Northants. Tel: 0536 744015 (3 lines).
HB Computers Ltd.,
20/22 Station Road, Kettering, Northants.
Tel: 0536 520910.

Micro Business Centre Ltd.,
Wolverhampton Computer Centr
17-19 Lichfield Street, Wolverhampto
W. Midlands. Tel: 0902 29021/2990
Taylor-Wilson Systems Ltd.,
Station Road, Dorridge, Solihull,
W. Midlands B93 8HQ. Tel: 05645 61
Walters Computer Systems Ltd.,
12 Hagley Road, Stourbridge,
W. Midlands DY8 3JD. Tel: 03843 70

YORKSHIRE

Ackroyd Typewriters Ltd.,
57/59 Leeds Road, Bradford,
W. Yorkshire BD1 5AF. Tel: 0274 7318
Yorkshire Electronics,
Caxton House, 17 Fountain Street, M
W. Yorkshire LS27 9AE. Tel: 0532 52
Yorkshire Microcomputers Ltd.,
28 Ramshill Road,
Scarborough, N. Yorkshire YO11 2QF.
Tel: 0723 78136.
Deans Computer Services Ltd.,
Unit 1, Sheepscar House,
Sheepscar Street South, Leeds,
W. Yorkshire LS7 1AD. Tel: 0532 432
Holdene Ltd.,
Bray House,
Leicester Place,
Leeds LS2 9BH.
Tel: 0532 459459.

"Dear

Deane Computer Services,
Sea Road North, Bridport, Dorset DT6 3BD.
Tel: 0308 2527
Milequip Computers,
7 Hare Lane, Gloucester, Glos. GL1 2BA
Tel: 0452 411010

SOUTH & SOUTH EAST

H B Computers Ltd.,
50/60 Collington Street, Luton, Beds.
Tel: 0582 454466.
Slough Microshop,
120 High Street, Slough, Berks. SL1 1JQ
Tel: 0753 24001
Kingsley Computers Ltd.,
132 Desborough Road, High Wycombe,
Bucks. HP11 2PU.
Tel: 0494 449749.
Amplicon Micro Systems Ltd.,
Richmond Road, Brighton, E. Sussex BN2 3RL.
Tel: 0273 608331.
South East Computers Ltd.,
Unit 2, Castleham Road, Hastings,
E. Sussex TN38 9NR. Tel: 0424 426844.
Stuart R. Dean Ltd.,
373 Southchurch Road, Southend-on-Sea,
Essex SS1 2PY. Tel: 0702 62707.
Apollo Reprographics,
Unit 15a, West Station Industrial Estate,
Spital Road, Maldon, Essex CM9 6TW.
Tel: 0621 56933.
Computer Sales and Software Centre Ltd.,
190/192 Cranbrook Road, Ilford,
Essex IG1 4LU. Tel: 01-554 3344.
Dataview Ltd.,
Portreeves House, East Bay, Colchester,
Essex CO1 2XB Tel: 0206 865835.
DDM Direct Data Marketing,
14 Ongar Road, Brentwood, Essex CM14 5HA.
Tel: 0277 229379/214168/230480.

Alphascan Ltd.,
Little Bourton House, Southam Road
Banbury, Oxon. OX16 7SR. Tel: 0295 75606.
Micro-Facilities Ltd.,
7/9 Church Road, Egham, Surrey TW20 9QL.
Tel: 0784 31333.
PPM Ltd.,
Harmitage Road, St. Johns, Woking,
Surrey GU21 1TZ. Tel: 04867 80111.

EAST LONDON

CSS Systems Ltd.,
502 Kingsland Road, London E8 4AE.
Tel: 01-254 9293/1674.
Merchant Systems Ltd.,
5 New Bridge Street, London EC4.
Tel: 01 583 6774.

NORTH LONDON

Chromasonic Business Systems,
48 Junction Road, Archway, London N19 5RD.
Tel: 01-263 9493/9495.
Davinci Computer Store,
112 Brent Street, Hendon, London NW4 2DT.
Tel: 01-202 2272.
Micro Computation,
8 Station Parade, Southgate,
London N14 5BL. Tel: 01-882 5104.
Missing Link Computers Ltd.,
Abacus House, 53-55 Ballards Lane, Finchley,
London N3. Tel: 01-349 4711.

SOUTH/CENTRAL LONDON

Cavendish Data Systems Ltd.,
74 Portland Road, South Norwood,
London SE25 4PQ. Tel: 01-656 8941.
DDM Direct Data Marketing,
86-87 Wilton Road, Central London SW1V 1DN.
Tel: 01-834 5016/5096.
Micro Computer Centre,
28 Sheen Lane, London SW14 8LW.
Tel: 01-878 7044.

AJR Computer Systems Ltd.,
80 Nottingham Road, Arnold, Nottingham
NG5 6LF. Tel: 0602 204001/206647.
Betos (Systems) Ltd.,
Bennett House, 155 Mansfield Road,
Nottingham NG1 3FR. Tel: 0602 48108.
Computer Services Midlands (Sales) Ltd.,
Dunlop India House, Abbeyfield Road,
Lenton Industrial Estate (West),
Nottingham NG7 2SZ. Tel: 0602 866366.
Jentech Services Ltd.,
Rosemary Cottages,
Nordley, Bridgnorth, Shropshire WV16 4SU.
Tel: 07462 5287.
Peach Data Services Ltd.,
5 Horninglow Street, Burton-on-Trent,
Staffs. DE14 1NJ. Tel: 0283 44968.
Business Equipment Rentals Ltd.,
99 Albert Street, Rugby,
Warwickshire CV21 2SW. Tel: 0788 65756.

WEST MIDLANDS

Business Equipment Rentals Ltd.,
Grosvenor House, 11 Grosvenor Road,
Coventry, W. Midlands CV1 3FF.
Tel: 0203 20246.
Camden Computer Systems Ltd.,
462 Coventry Road, Small Heath,
Birmingham B10 0UG. Tel: 021 771 3636.
Computer Services Midlands (Sales) Ltd.,
Refuge Assurance House, Sutton New Road,
Erdington, Birmingham, W. Midlands B23 6QX.
Tel: 021 382 4171.
Ibek Systems Ltd.,
437 Stoney Stanton Road,
Coventry, W. Midlands CV6 5EA.
Tel: 0203 661162.
Microtrading Ltd.,
641 Bromford Lane, Ward End,
Birmingham B8 2EP. Tel: 021 784 0077.

Holbrook Business Systems Ltd.,
Moss House, High Street, Mosboroug
Sheffield, S. Yorkshire S19 5AE.
Tel: 0742 484466.

NORTH WEST

Automated Business Equipment L
Mersey House, Battersea Road, Heato
Mersey Industrial Estate, Heaton Mer
Stockport, Cheshire SK4 3EA.
Tel: 061 432 0708/4299, 061 431 71
Dunglinson Micro Systems,
Brunstock, Carlisle, Cumbria.
Tel: 0228 24918/25892.
D Kipping Ltd.,
The Systems Centre, Chester Street,
Chestergate, Stockport, Cheshire SK3
Tel: 061 477 3880.
Executive Reprographic & Busine
Consultants Ltd.,
2-4 Oxford Road, Manchester M1 5QA
Tel: 061 228 1637.
Cytek (UK) Ltd.,
Sandringham House, 9 Warwick Road,
Old Trafford, Manchester M16 0QQ.
Tel: 061 872 4682.
The Computer Supermarket
(Manchester) Ltd.,
Knightsbridge Mall, Arndale Shopping
Manchester. Tel: 061 835 1116.
POS Computer Systems Ltd.,
50 Gidlow Lane, Wigan WN6 7DP.
Tel: 0942 31464.
Computers & Business Systems,
89 Manchester Road, Nelson,
Lancs. BB9 7HB. Tel: 0282 601191.
Datel Computing Ltd.,
323 Clifton Drive,
Lytham St. Annes, Lancs. FY8 1HN.
Tel: 0253 727051.

ston Computing Centre,
ctoria Buildings, Fishergate, Preston,
cs. PR1 2NJ. Tel: 0772 57684/58445.
kliff Micro Computers Ltd.,
umford Street, Liverpool L2 8SZ.
051 227 2568.
ck Computer Services Ltd.,
-298 Derby Road,
tle, Liverpool, Merseyside L20 8LN.
051 933 5511.

NORTH EAST

x Datalog Ltd.,
lescliffe Industrial Estate, Eaglescliffe,
ckton-on-Tees, Cleveland TS16 0PN.
0642 781193.
roprocessor Services,
Beverley Road, Hull,
th Humberside HU3 1XR. Tel: 0482 23146.
roware Computers Ltd.,
ry House, 1133 Hessle High Road,
, North Humberside HU4 6SB.
0482 562107.
rie & Maughan Microcomputers,
-206 Durham Road, Gateshead,
e & Wear NE8 4JR. Tel: 0632 774540.

MBM Macmicro Business Machines,
Tulloch Street, Dingwall, Ross-Shire IV15 9JZ.
Tel: 0349 63922.
Microcentre
(Complete MicroSystems) Ltd.,
30 Dundas Street,
Edinburgh, Lothian EH3 6JN.
Tel: 031 556 7354.
Microcom,
Fortune House, 74 Waterloo Street, Glasgow,
Strathclyde G2 7DA. Tel: 041 204 0812.
Robox (Office Equipment) Ltd.,
Unit 14, Anderston Shopping Centre,
Argyle Street, Glasgow, Strathclyde G27 PH.
Tel: 041 221 5401/2.

NORTHERN IRELAND

Northern Ireland Computer Centre Ltd.,
4 High Street, Holywood, Co. Down,
Northern Ireland. Tel: 02317 6548.

REPUBLIC OF IRELAND

Commodore (Concessionaries)
IrelandLtd.,
Barton House, Francis Street, Galway, Eire.
Tel: 091 67156/7/8.

WALES

Computer Supplies (Swansea),
Systems Division of Radio Supplies Ltd.,
82 Gower Road, Sketty, Swansea SA2 9BZ.
Tel: 0792 290047.
Reeves Computers Ltd.,
6 Walter Road, Swansea,
W. Glamorgan SA1 5NF. Tel: 0792 468103.

Worried about which computer your company should get? Anxious about the size of RAM it should have, or whether or not it'll need peripherals? Simply confused by all this computer jargon?

Then talk to your local Commodore dealer. He knows more about computers in business than almost anyone. (Representing the world's leader in micro computer business systems, he has to).

Marje..."

y Computer Services Ltd.,
Osborne Road, Jesmond,
wcastle NE2 2AJ. Tel: 0632 815157.
IP Ltd.,
toria Buildings, 46 Grainger Street,
wcastle Upon Tyne NE1 5QD.
0632 614646.

SCOTLAND

shire Office Services Ltd.,
Douglas Street, Kilmarnock,
athclyde KA1 1RB. Tel: 0563 24255.
al Business Systems,
Fort Street, Ayr. Tel: 0292 81776.

Reeves Computers Ltd.,
33 Bridge Street, Newport, Gwent NPT 4BH.
Tel: 0633 212331.
Reeves Computers Ltd.,
24 Spilman Street, Carmarthen,
Dyfed SA31 1LQ.
Tel: 0267 232441.
Rockliff Micro Computers,
Pendre House, High Street, Mold, Clwyd,
N. Wales. Tel: 0352 59629.
Sigma Systems Ltd.,
266 North Road, Cardiff CF4 3BL.
Tel: 0222 34865/34869/25800.

All the dealers listed here were selected by Commodore because they're the best. They choose to sell Commodore computers for exactly the same reason.

Any one of our superb machines will help solve many of your business problems.

And when it comes to value for money, well, it will save you rather more than the cost of a letter to Marje.

commodore
Changing business for the better.

For more information about the 8000 Series please telephone or write to your nearest Commodore dealer or to us at:
The Commodore Information Centre,
675 Ajax Avenue, Slough, Berkshire SL1 4BG.
Telephone: Slough (0753) 79292.

Name ______ Position ______

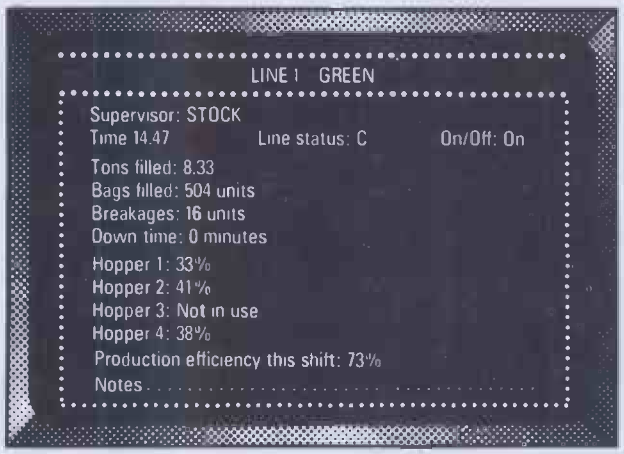
Company ______

Address ______

Postcode ______ Tel: ______

85PCW1183

Hundreds of problems. One solution.



Controlling the production of tomato grow bags may sound simple enough, but co-ordinating *all* the different aspects on a brand-new production line was not without its headaches. When the production manager turned to the company's new micro for an answer, it was THE LAST ONE which made it possible to create a system in hours rather than months. TLO then went on to produce over *one hundred* individual solutions for this company in a period of less than a year.

A simple, moving, graphic display was needed by a major computer retailer to demonstrate how a new product line could maintain compatibility with some of his earlier machines. Half an hour's work with THE LAST ONE and he had a program displaying bar-charts, graphs and printouts. Little more than an hour later the same program was up and running on three other makes of micro. When asked what made the four machines compatible, he laid the credit squarely with THE LAST ONE – "some manufacturers would be hard put to even use the same mains plug – TLO at least gets them all speaking the same language."

Using a computer to solve a complex problem is not always as easy as it sounds.

A product called THE LAST ONE however, has helped crack hundreds of computer problems for users throughout the world.

Launched less that two years ago, TLO allows any computer user to design, develop and modify, accurate and complete solutions without needing to understand the complex code languages used by the machine in question.

Now in use in installations from major clearing banks to one-man businesses, TLO is helping solve in hours, problems which used to take days, weeks and months.

AT £330, IT'S A MIRACLE. AT £50, IT'S A GIFT!

A new fully operational Compact version of TLO is now available. Designed primarily for the occasional user wanting to harness the power of the world's leading program generator, it costs a highly competitive £50 (+VAT), and this is *refunded* should you subsequently upgrade to the Professional version.

The Professional multi-file version of TLO includes new time-saving features and costs from £185 to £330 (+VAT) according to the hardware installation.

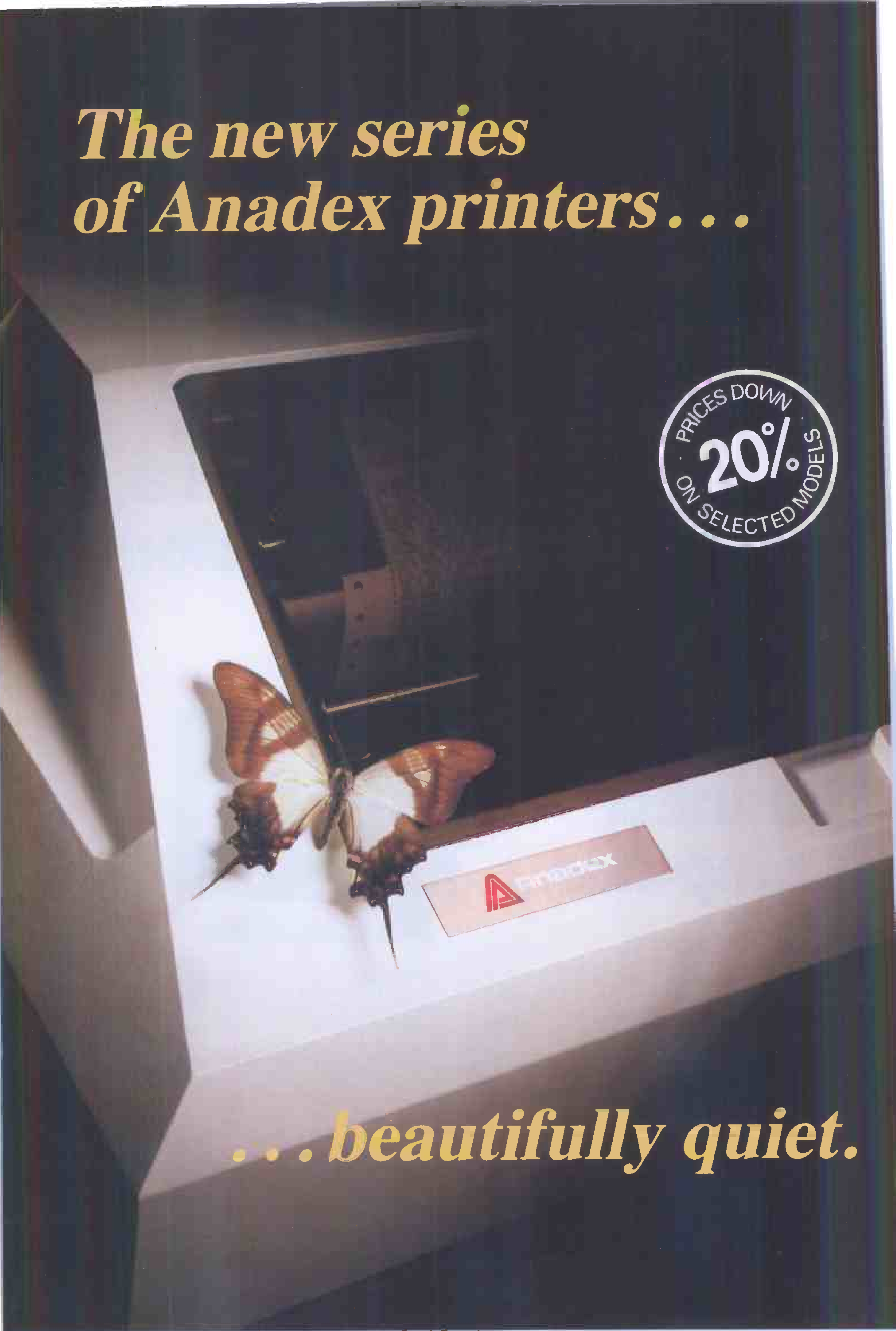
TLO runs on the Apple II and IIe, Commodore 4032 and 8032/96, TRS-80 Model II (TRSDOS or CP/M), most CP/M, CP/M 86 and MS/DOS machines including the IBM PC (PC-DOS), Wang PC, Zenith Z100, and Sirius.

Find out what TLO can do for you by contacting your local dealer or send for an information pack.

It could be the solution to hundreds of *your* problems.

THE LAST ONE™

• **D.J. 'AI' Systems Ltd., Dept E. Station Road, Ilminster, Somerset TA19 9BQ. Telephone: Ilminster (04605) 4117** •


The new series
of Anadex printers . . .
PRICES DOWN
20%
ON SELECTED MODELS
Anadex
. . . beautifully quiet.

Guy Kewney delivers his monthly package of micronews.

To catch a thief

There are pirated copies of Turnkey Software's 'Databoss' file management system on the market.

Please do not buy duplicated copies of software. As things stand today, you probably will not be charged with 'being in possession of stolen property' — but there is always the outside chance that the law will be changed, and you will be in trouble.

This is a sensitive subject with me, and has been for a long time, especially since I don't share the opinion of most software writers about 'piracy'.

To me, software piracy is simple. It is what happens when a program is taken by a software house which didn't write it, and re-packaged, duplicated and sold to customers.

Perhaps you will think it unnecessary, even silly of me, but I'm actually going to make a clear, unambiguous statement about piracy: it is morally disgusting, and should be legally punishable.

By contrast, I have no scruples about borrowing a diskette from somebody else. And because of this, programmers have written poison-pen letters to me, complaining that I am in favour of piracy. It even got to the point where, recently, an old friend actually quoted an article I wrote, saying that I was quite mad to encourage disk copying. In fact, the article denounced the law on software piracy, and said that disk copying should be the subject of clear legislation — but you would never guess that from what my old friend said.

According to him, I believed firmly in the right of fraudsters to copy disks and sell them. The reason for our divergence of opinion is simple enough: I originally started the article (denouncing piracy, you remember) with an explanation, for the inexpert reader, of just how easy, technically, it was to make a copy of a disk. I added that the law appeared to offer no protection against this sort of thing. And at this point, my friend's vision (he is a programmer) became totally inoperative (I imagine his eyeballs bursting with apoplexy) and he was obviously unable to read my next statement — that it was a scandal, and something ought to be done about it.

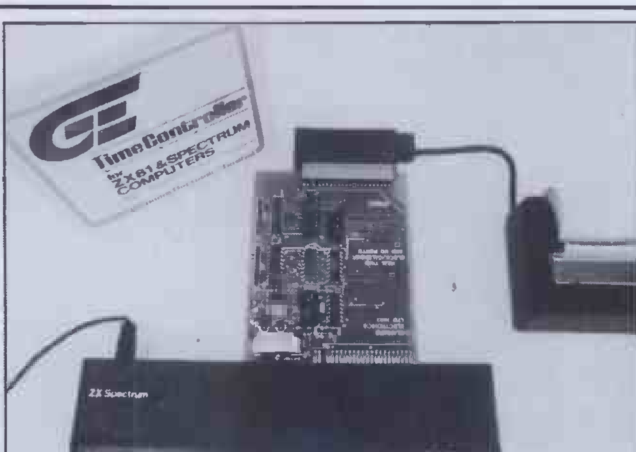
But all he noticed was that I had told people how to steal his program, and had added the reassuring information that it was quite legal.

When is the software industry going to wake up and smell the toast? Nobody is going to change the law if they keep saying that disk copying, even for private purposes, is illegal. And until the law is changed, the real pirates will continue to operate. And the real pirates are the computer shop managers who buy (or steal) a single copy of a program, and then supply them at a 'discount' to people who buy computers from their store. Few do. But those who do should be legally accountable, and they aren't.

Do not fear that a law outlawing this sort of piracy might prevent you from borrowing programs, or giving them to friends. Even if this became punishable by flogging, nobody would ever get caught.

But if you have a copy of Databoss and you suspect that the dealer who sold it to you ripped it off, Turnkey will give you £100 for any firm evidence you may have. And if your evidence leads to a 'successful conclusion' they will give you £500.

Details of this special offer in 02407 5995.



A clock for Sinclair's two computers, the ZX81 and Spectrum, is available for £34.50 or £38.50 (respectively) from Glanmire Electronics.

The device is called the Time Controller, and it allows you to write programs that can read the time, or the date, from the add-on card.

Glanmire is looking for distributors: details from the company in Ireland on Cork (021) 889209 — and make sure you dial Eire first, won't you?

Elan vital

A truly new design of home computer is likely to be produced by a new British computer builder in January. It is the work of one of the best-known computer brains of Britain — David Levy.

Levy's company is called Elan, and he launched the company in September by showing the press a prototype machine.

There are so many amazing things about this computer, the Elan Enterprise, that it hardly seems fair to start with the news that it has stereo sound. By comparison with other things, that seems almost trivial.

The machine looks frighteningly impressive. It reminds me enormously of the 'feel' of the BBC Micro when it was first announced — that machine answered all the questions that people had learned to ask about microcomputers, and took them all a step further.

The first thing you notice about it is that it costs £200, and looks very nice. Then you ask 'how much memory' and add that you hope it's a bit more than 32 kbytes. It is — it will address four megabytes of memory (so we're told!).

That alone makes a mockery of the question 'is it eight or sixteen bit' because the main advantage of all the more powerful sixteen bit micros available is the amount of memory they can plug in. No other microcomputer under £1000 can address four megabytes. Actually very few personal computers have disk space of that amount.

The other theoretical reason for having a 16-bit processor is speed. But the BBC Micro, Spectrum and the Commodore 64 have all taught us that an ordinary eight bit processor driving some clever 'custom chips' can outperform a 16-bit processor in much the same way a moderate conductor can lead an orchestra to drown out the most brilliant piano soloist. Watching the prototype perform, it became apparent that the Elan will indubitably be the best computer on the market at colour graphics. It has a maximum of 256 different

The Elan Enterprise comprises a 64k RAM expansion box and a 3¼in microfloppy disk drive.

colours — some so close to each other that you could do an entire rainbow without being able to see the joins. And it can plot incredibly fast. It isn't as fast as the Pluto add-on colour device, but it is faster than any other micro I've seen, and my guess is that animated graphics on this machine will be better than on any existing micro.

At the highest resolution, this machine gives an incredible 672 by 512 dots. And it can change the colour of these very fast indeed.

Most good graphics today are done on the basis of moving 'sprites' around the screen. The Elan doesn't do this yet, but it will.

Part of its clever design idea is an expansion 'stack' with its own power supply. This is a block which can take extra memory, disks, and any other add-on unit imaginable now or in the future — and one add-on which Elan has already started imagining is a sprite controller. This would move the alien monsters round memory, and tell the central computer when the bullet hit them, or the bomb hit you. And because there is no real limit to memory, you can have pretty big sprites, if you like.

Elan's technical man, a man called Madge, stressed the 'ease' of the Basic, the Lisp and the Forth languages. Basic is supplied in the box, with some other software, as part of the operating system. Lisp and Forth come as plug-in cartridges (they can be up to 64 kbytes in capacity, by the way, much bigger than anything available on rival machines). By 'ease', Madge meant that you could use as few of the instructions as you liked, or as many.

For example, where the BBC 'sound' statement needs an enormous string of numbers to follow, all with the right punctuation, the Elan lets you leave most of them out. Tell it the pitch of the note, and it will give you the default attack, sustain, modulation, and so on. Ask to be put in control and you can string together ring modulator noises. About the only thing that I don't think it is planned to do, is provide concurrency. Ah, a buzzword.

I gather that, theoretically possible though it may be, the Elan is not intended to do word processing work at the same time as it plays Space Invaders, and answer the phone with its other hand.

This, I am sure, is a mistake. The world doesn't ask for concurrency now, but in a year's time, it will become a well-known concept, and as soon as you have tasted it, you will want it.

Imagine never having to wait for ten minutes while the machine finishes a long job before starting the next one. Imagine never having to stop, close all your files, store all the data, and then find the new program, load it, and open a new set of files, before being able to find a simple data item such as 'what's Bill's phone number?'

Here is the one area where, perhaps, the decision to use an ordinary Zilog Z80 as the central processor may prove a handicap. The specially-designed chips in the Elan may be able to do an awfully complex lot of things, but they can't actually run the show. They need a powerful central processor to conduct. And for concurrency, I suspect that a Z80 may find itself a bit short on raw power.

As to those clever chips, there is a little tale there.

The clever chips in the Sinclair and BBC are called, boringly, 'uncommitted logic arrays', which is silly really, because they have been committed. They were uncommitted until Sinclair and Acorn got hold of them. No matter — the title is unimaginative. Commodore called its ULA a 'Video Interface Controller', or 'VIC chip' which got it into trouble in Germany, where VIC means something quite different. But it made a great name for the computer. Then when it split VIC up for the Commodore 64, it produced a second controller, called a 'Sound Interface Device' — which is SID, of course.

Elan, when it starts building Elan computers, will supply them with a Nick chip and a Dave chip. Nick is Nick Toop, the man who designed the electronics of the Acorn Atom, a now obsolete but (at the time) highly original microcomputer. His chip handles all the clever video tricks that Elan can get up to.

Dave, however, is Dave Woodfield. He is the engineer who won the 1981 Micro Mouse contest with a GKN sponsored micro robot on wheels — a thing called Thumper, which bashed its way to the centre of a maze quicker than any other micro mouse. And his chip does the sound synthesis.

The only question that remains to be asked, once you have looked at the specification, is: 'Can it be built by January?'

If there is one thing Levy can be said to be famous for (other than having been a chess grandmaster), it is making predictions that fulfil themselves. He originally became famous ten years before he won a bet. The way he became famous was by announcing with a great deal of effective publicity what he was doing. And what he was doing was betting that in ten years' time, he would still be able to play a better game of chess than any computer. At the end of ten years (around five years ago, this was) he beat the world's best computer program.

He collected £10,000 for it.

If his current bet comes off, he could make rather more than £10,000.

There is only one other puzzle to gnaw at, while we wait for the first machines to test (in December). That is: who is Elan?

Elan is financed, says Levy, by 'an international trading company' — but he won't say

The trouble with most cheaper systems is that the bargain usually ends with storage. This observation was made by a company called Phoenix, launching its Stratos computer, which, as you can therefore probably guess, has larger than usual disk storage capacity. The people at Phoenix have a point. The original Apple II and the first IBM diskettes, the Osborne in its incarnation, and several other machines, were notorious for having around 100 kbytes of disk space. In fact it is quite likely that one reason for the popularity of the Sirius in Britain was the fact that it offered a megabyte of storage on two floppy disks. Possibly the same could be said of the PET. The Stratos system, under £2000, offers 2.5 megabytes, which (as they modestly observe) represents a 'massive increase'.

The penalty is that you need eight-inch disk drives. Full specification from Phoenix on (061) 236 1172.

anything about it except that 'it isn't important who it is'.

Obviously it is an international Indian company, because the very friendly managing director, one Mohan Lal Mirpuri, is very obviously an international Indian gentleman. He used to work for a company called Domicrest, a company which recently announced a Levy-designed device called the Bisztec, 'a sort of half calculator, half electronic diary' and should have it on the market this month.

The company chairman, Lachu Mahtani, is also managing director of a company called Locumals UK Ltd, a trading company (but not an international one).

But why all this is meant to be a secret, beats me.

Half-hearted

Those who like the Lotus program called 1-2-3 (reviewed in this issue) call it 'one, two, three' because, the makers say, 'it is as easy as one, two, three' to find data in a database, use spreadsheet modelling, or even edit text.

Those who sell competing products say that it should be pronounced 'one and two thirds' because it is a spreadsheet, with a third of a database, and a third of a wordprocessor. In all honesty, I don't think anyone will ever buy it as a wordprocessor. You can, it is true, open up one of the spreadsheet cells and define margins, and make it as big as you like, and type into it for hours. But the only reason you would want to would be that you already had 1-2-3 loaded, and you didn't have enough of a letter to write to make it worthwhile loading WordStar.

Anyway, the product is selling like crazy in America, and if there were thousands and thousands of IBM Personal Computers here, as there are there, then the 60,000 packages Lotus sold there would quickly be translated into a similar number of sales here, I'm sure. However, in this country, the first thing that has to be done is to get it up on new computers. Now that Lotus has come to Britain, no doubt that will happen quickly. A special version has been produced for the Hyperion (it loaded OK before, but produced the occasional odd result) and one is on the way for the Sirius/Apricot family.

More information, for anybody anxious to get a version for their own favourite IBMulator, from Lotus's new office: contact publicity agents HHCC International for details on 01-499 8321.

Radar Rat Race is a Commodore 64 game which will be familiar to arcade games players of two years ago — but I haven't seen the original game around for ages, and I'm not going to name it, in case some humourless megalomaniac starts a lawsuit.

The game is important, however, not because it is good (though it may be) nor because it could feature in a lawsuit (it may never do so) but because, as you can see from the picture, it is a cartridge.

Commodore says that it is one of the first 64 cartridges. If anybody did one earlier, why didn't you send it to me?

Accountant's lot

Tempting providence is a daft way to spend the weekend, so I won't say that Pegasus is the best-selling accounting package in the UK. However, it certainly is coming close to that, with most tax inspectors having heard of it — so the expansion of the software is news.

The expansion comes in the form of two new modules: sales order processing, which is part of the invoicing module, and job costing, a new module which can provide costs analysis for up to 32,000 different jobs under up to 125 cost types. The one thing it can't do is act as its own database search module: you have to know account numbers to use it. But it is one of the very few standard software packages (Silicon Office is another) which can make sense of a system with hard disks. You'd be amazed how rare this is.

Details from dealers, or on (0536) 522822.

Osborne's demise

Osborne, the company that invented the portable computer, has died. Osborne, the man who founded the company, is doing his best to distance himself from the sad story of how his company died. And Osborne (UK), the European subsidiary, is chewing its fingernails, hoping that nothing interferes with supplies of machines from the very full American warehouses.

At the time of writing, nobody inside the American headquarters would say a word to journalists. This wasn't just shame at having cocked up one of the most promising ideas of the decade, but legal caution. In America, executives of a company which dies are liable to be taken to court in person by angry creditors who think they can prove they were conned into thinking that the company was able to pay them.

Even Adam Osborne himself — formerly the most outspoken man imaginable — was unable to say a word to the press.

However, according to close friends, he has come to regret deeply his selection of a successor, Janiuk (that isn't how you spell his name, but I can't find a reference), ex General Foods big businessman. And certainly, the events of the last nine months of OCC didn't follow the script that Adam had laid out before me a year ago. Originally, the plan had been to introduce the model II (now the Executive) at the same price as the Osborne I, and to cut the old machine down to \$1300 or so.

At the same time, the scenario went, production of the Osborne I would be stopped, and as soon as stocks died, a new machine, the Vixen, would be released.

I saw a Vixen in March, working. It was half the size of the original machine, with half-height diskettes, and a hinged keyboard. You could use it on your lap. And the reason it was never launched, say my sources, was simple: the new boss decided that the Osborne I still had a long life left. And instead of stopping production, he ordered parts enough to build 15,000 more.

The other thing he did was to price the Executive at \$2600. This would have made it a very profitable product, and on the spreadsheet it made Osborne look a very profitable company.

But customers don't care about the company spreadsheet. And faced with the choice of a Kaypro II or the Executive for \$1000 more, they gave Kaypro a lot of business.

The dealers couldn't shift the Osborne I's in America for a very simple reason — the street price had dropped to

$1250. Both Sears and Xerox, the biggest chains, had discounted the machine, and nobody else could afford to match the price. Exit Osborne Computer with huge inventories.

The most likely next step (at the time of writing) will be for Chapter Eleven bankruptcy — this freezes all debts, and arranges for the company to be sold off or split up. With a lot of luck, somebody like ITT will buy it, and carry on selling the Executive and the imitation IBM board that can be added to the Executive, and without luck, the whole company will sink without trace.

As to when it will all be sold (if it is) anybody's guess will do. Sometimes this sort of thing takes years. Sometimes it takes a couple of months. With luck (!) it could be sorted out before Christmas.

In the meanwhile, any tears you see on Kaypro executives' faces are tears of laughter.

Engineering success

A new company, IT Research, has been set up to provide software; unusually, this one is basing its request for fame on the reputation of its engineer boss.

His name is SY Poon, and he once won the James Clayton Fund prize of the Institution of Mechanical Engineers. The idea is not that a mechanical engineer automatically makes good computer software — instead, Poon's company plans to write software for small engineering firms, and for laboratories.

Packages such as engineering design programs will be launched soon, and sold, complete with the hardware needed to run them.

Details from IT Research on (0636) 71221.

Bread and butter

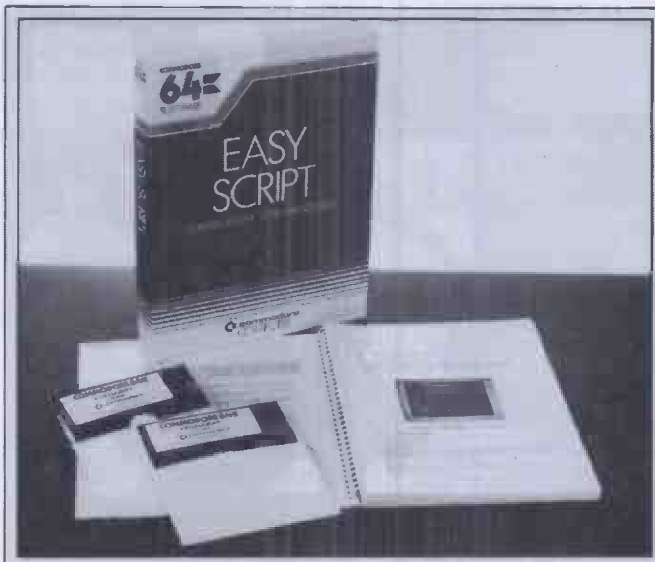
At the time of writing, the launch of IBM's home computer, code-named the Peanut, was widely expected in mid-October. Nobody knows when IBM will do something, least of all IBM itself. But the straws in the wind are plentiful — sample machines in the UK, for a start — and it may be that by the time you read this, the announcement is just being put into the television commercials.

People who believe that the Peanut is for October have the following evidence:

First, the advertising agencies who normally book space for IBM have been buying TV time in America, and for an unspecified product. Second, there is the Christmas buying season to catch. And third, the machine is said to be very nice and quite innovative — but it won't be all that wonderful in a year's time if there haven't been big sales in the meanwhile. And in the meanwhile, the Commodore 64 is selling, worldwide, like hot bread.

Those who say that the launch will be delayed, suggest that it will be in January. Their evidence is: widespread reluctance by IBM executives outside the US to get caught up in the price war that will rage from now until Christmas, the lack of a large body of ready-written software, and rumours that January is a hot date inside IBM for some sort of product.

IBM executives, when asked what will happen, always say: 'It is not IBM policy to speculate on future developments.' I asked one or two anyway, and they said: 'As you know, it is not IBM policy to speculate on future developments.' Tales of the unexpected.



Six months ago, people used to say 'Well, we have disks, but nobody buys them. Too expensive.'

The same would be said of colour displays.

Today, sales of diskettes probably warrant a full market research project. Increasingly I meet Commodore 64 users, BBC Micro users, and even VIC 20 users, who have lashed out £200 to £400 on a disk drive, and just won't use tapes any more.

This is starting to be reflected in software sales: increasingly, suppliers are offering the trade the option of buying a disk, rather than supplying on tape as standard. The above illustration of Commodore's Easy Script wordprocessor (£75 including VAT, and a very nice product) is just one of several I might have chosen to make the point.

The other thing that people seem to be spending money on is a second display. Originally, it was thought that a few of the richer users might possibly buy a second television. In fact, people seem to be paying money for colour monitors — in order to get the computer user of the family off the television.

Already, I've received my first three-dimensional computer game, which has special glasses with red and blue lenses, to get the effect. You need colour for that. When I can get the television away from the Top of the Pops watchers, I may find out what sort of a game it is.

Details of the game, by the way, from Postern, on Northleach (04516) 666.

Victorious survivors

After Osborne, Grundy, Dragon (nearly) Information Technology and Computer Services, who else is for the chop?

American doom-sayers are mostly worrying about Victor, the company which builds the Sirius. They are also worried about Apple, the company which ought to build the MacIntosh. They aren't optimistic about Atari, and they fully expect Mattel and Texas Instruments to pull out of the business.

The Victor problems are highly visible. ACT, the company which sells the Sirius in Britain, has not gone to any trouble to conceal its corporate relief at having arranged a factory in Scotland, where it can make the Sirius as well as the new Apricot, if anything goes wrong.

Victor was part of the Kidde Corporation, which put up most of the money for Sirius. Sirius took over Victor last Christmas, together with an enormous number of totally non-functional personnel.

'We sell one Sirius for every two Victor machines made,' a senior ACT executive told me, 'but our entire distribution outfit employs only 200 people. And that includes the people doing our Pulsar software.'

By contrast, he said, 'Victor had over 1200 people just doing distribution, and that's apparently the reason behind Victor's appalling losses.'

It may be that ACT can insulate itself from any problems at Victor. Nonetheless, the management in the Midlands is very anxious to push Victor's Chuck Peddle back into profitability — especially since Victor plans to build and sell the Apricot in the US. Under this sort of pressure, Chuck Peddle will be able to lean heavily on the company which originally put up his money — Kidde — for some more money. But Kidde is no bottomless pit, and my information is that Victor has one more term. It made a big loss in the second quarter; it forecast a profit in the third and didn't make it. Now it has to make a substantial profit in the fourth, or Kidde will try to sell it off, say my sources.

This domestic scene, featuring young Philippa Aldrich and her mother Sandy (holding the keyboard) was taken in Colgate. They are using a Rediffusion Teleputer micro, which can work as a CP/M micro, or as a Prestel set capable of storing ten or more pages internally. It saves you having to access the pages twice on the phone.

Colgate is not a toothpaste — it's a place where Mike Aldrich lives (near Pease Pottage, in Sussex, he says) and where his family can find him by calling up information on a Teleputer micro.

Mike Aldrich has two Teleputers, one at home, and one in his office in Crawley. Crawley? Isn't that (you ask) the place where the Teleputer is made by Rediffusion Computers?

Yes it is, and Mike Aldrich is the same Mike Aldrich who is known as managing director of that company. He has a third Teleputer in his central London office, too.

I suppose it's nice to know he has faith in his own product, and that he really can access Prestel with the thing.

Accordingly, ACT has been very pleased to see Chuck Peddle dismiss 600, then another 200, of his 'overstaff' — and now it must watch and hope that his financial backer, Kidde, still retains faith in his future.

In the UK, of course, Osborne Computer is in a similar pickle. It is not necessarily involved in the crash of Osborne US, since it has always bought its machines at US dealer rates. But successful though it may have been in growing within its capacity, it still has the awkward problem of convincing people that it can get new machines.

The plan there, like the ACT strategy, is to convince people that it can build computers in Britain. ACT, of course, has the advantage of having decided to do this months ago. But Osborne has had to make its announcement to put the fire out, and when its executives say that they plan to build 300 machines a month, they will have to face blank disbelief from a lot of sceptics. If those sceptics include the financiers, Osborne Computer will be in a tough spot.

Move into Orbit

The user group for BBC Micro users, Beebug, has taken the big brave decision not to include the Acorn Electron in its brief.

This isn't quite the sacrifice that you may be thinking: Sheridan Williams, the organiser, tells me that he will be starting a new group called Orbit.

The group has already started, in fact, with a free offer of five new games programs.

First reaction to the new Acorn machine from this software house was that it was very easy to move software from the BBC Micro, but not so easy to load it.

'The BBC is very flexible about what volume you set your tape player to,' said the head of the firm, 'but we found that the Electron is particularly fussy. You have to set the volume just right.'

In the meanwhile, those lucky people with an Electron should send their requests to Beebug's address, because I've lost Orbit's address.

Fruitful response

It is quite possible to buy Peachtree software without knowing it, so if you are surprised to hear that the UK offices are expanding enormously, have a quick check through the packages you've bought.

Chances are that something marked 'IBM' or 'Dec' on the box may prove, on close inspection, to be a Peachtree product. The parent company, MSA (once, Management Science America) has just announced revenues for 1982 (yes, that was last year, but it takes a long time to count all those dollars) which are enormously bigger than most computer hardware companies.

The actual number of dollars paid last year for MSA products got over the $100 million mark, with profits getting very close to the $10 million.

In the UK, what irks the company more than a bit, is that dealers are failing to appreciate what they have on their shelves.

A distraught managing director, John Hale, recently authorised a merchandising experiment — a dynamic young woman actually going into a few computer shops and acting as a special sales assistant, the way the Revlon girl sometimes does in Boots — to prove to dealers that the stuff can be sold.

'We have a serious problem,' he said. 'We assign the marketing to our licensees — they package the software as their own, and they sell it, and pay us a much lower price. But having done that, instead of having every hardware maker selling our products as eagerly as they sell their own, we find some of them just failing to run advertising campaigns, or promotions. And we feel we can't tread on their toes by saying "Buy Xyzco software — it's really Peachtree," because they wouldn't be at all pleased.'

It can't be all bad news, however, his company has trebled the UK operation to handle the growth in business, and has actually taken over the MSA building in Maidenhead, plus the next-door Philips building.

And so the new address: The Peachtree, 99 King St, Maidenhead, Berks SL6 1YF. (I wish the Post Office hadn't decided that Maidenhead was part of Slough.) Tel: (0628) 32711.

Fight to the finish

The boring battle between Microsoft's MS-DOS and Digital Research's CP/M-86 can actually be quite interesting in one way — it illustrates the different sorts of microcomputer, and how they are used.

For example, buried in the announcement of 'version 3.0' of an operating system called Xenix, sold in this country by the highly profitable software house Logica, is the observation that 'under Xenix 3.0, any MS-DOS file may be read from or written to, providing profitability of data between MS-DOS and Xenix machines'. And the announcement from Logica goes on to suggest that 'a number of machines, such as the Durango Poppy' (the what?) 'now run both operating systems.'

The list of such machines may seem as underwhelming to you as it does to me: but the important point is that the trick is possible simply because Microsoft has written both Xenix 3.0 and MS-DOS 2.0 with the same routines. So when a programmer asks the operating system to write data to a file, it does exactly the same thing for both operating systems on the same machine.

The interesting thing, however, is not how Microsoft has written the system. It is more a question of what sort of user will be running it, and there, Logica is firmly on the side of the user who is multi-.

It may help to pretend we're talking about filing cabinets and libraries, to show you what I mean.

In offices, anybody can have a filing drawer in a desk. The folders may be identical to the ones in the battery of filing cabinets, but the significant point is that only you can get at them, and there are only a few of them. No office user can afford a library all to themselves. However, the office may well have a central library, and here are two ways of using it. First, you can ring up the librarian and say what you want, and it will be brought (or left on a shelf at the door) for you. Alternatively, you can go down, and blunder around looking for the file or book you want yourself.

The 'librarian request' system is the same system as our own filing drawer. It just holds more. The other system, where several people can be looking for information at the same time, is obviously of more use to a business.

Now, two years ago, it was fairly simple to relate all that to computers. A minicomputer was big enough to work as a central library. A microcomputer, on the other hand, could only work as a desk drawer. It was a question of how much information you could get into it.

Today, a personal micro can have the storage and processing power of a largish minicomputer, which means that people installing an 'office library' type of system might well choose an ordinary machine, like ACT's Apricot, or Tycom's Microframe, or the many other machines which Logica says it is now writing Xenix for. And they can then pretend that it is a multi-use mini.

Admittedly, people did try this two years ago, with things like the Black Box from Rair — but they soon gave that up as a waste of time — rather similar to having an illiterate librarian.

However, there is another way to use the power of these machines, and that is to use them as if they were enormous office libraries, but for the use of one executive. In library terms, the idea is nonsense. In computer terms, the cost of new micros is so low that it's easy. The technical term used is 'multi-task' systems, where one user at one micro can actually be doing three or four things at once.

Where Xenix aims, primarily, to let three or four people all work on the same block of data (essential in medium-sized offices) the Concurrent CP/M-86 system aims to let one person have constant access to three or four blocks of data. That long-winded explanation will have been very old hat for some readers: but without it, there was no way to explain why Logica's announcement of the new version of Xenix was important to people who think they are using 'mini' computers, rather than to people who have personal micros. The other thing that needed explanation was the fact that though (no doubt) Microsoft will accept the Logica publicity as 'evidence of MS-DOS market lead' it is in fact a different market. And CP/M-86's availability on the Apricot, with windowing, may be a far more significant matter for most users.

What amused me about this picture of a Data Dynamics ZIP printer was not the fact that (according to the makers' information, anyway) it still worked after the fire. No, it was the definition of what sort of printer it is. Long ago, printers were sold as KSR or RO printers. KSR stood for 'Keyboard Send Receive' and that meant, simply, you can type on this, and the computer will receive the codes for the letters. And it can then send messages back, and print them on the printer.

The other acronym, RO, stood for 'Receive Only' and it meant that there was no keyboard.

My press release describes it as 'Read only' which I'm sure isn't meant. A printer that can't write?

A mere month before releasing the Sig-Net 3 computer (no details at press time) Shelton Instruments bought a watch for the earlier model 2 micro.

This watch is like all modern digital watches, in that it gives the date as well as the time. It costs a mere £60, and it means that you can identify the files you use by time and date, as well as name.

Details, for those who can't find a Shelton shop, on 01-278 6272.

Well suited

The Micro Professor computer is the subject of a lawsuit by Apple, which is alleging breach of copyright on Apple operating software in chip form.

The supplier of the Micro Professor, however, (Sirtel UK) is a little anxious to point out that the lawsuit has not yet been resolved, and that it doesn't actually stop them making or selling other products from the Taiwan company, Multitech Industrial Corporation.

Sirtel has agreed (it says) not to sell the MPF-II, an imitation of the Apple. But if it can persuade people to accept new versions of the operating system especially people at Apple, that is — then the machine could continue to be sold.

This announcement looks to me like a public statement of the sort needed to reassure dealers that there is some point in actually going ahead with any meetings planned with Sirtel.

Busy people don't like setting off on casual hunts for wild geese, and the news of the Apple lawsuit has been emphasised by reports from America that the courts there have agreed that programs in chips carry copyright after all.

Copyright law being a very strange thing, the American lawsuit could actually have a strong effect on British copyright judgments — and taken together with Sirtel's agreement not to sell the MPF II until the lawsuit is settled, must have been very discouraging to potential dealers.

But it's hard to see how the news that Sirtel still hopes to sell the machine — with a different operating system — one day, affects customers today. I suspect it doesn't.

Bringing Tandy into line

It is not widely known that Roger Wilson, Acorn's boy programming genius, originally designed the Proton with a Basic that had no line numbers. Then the BBC adopted the machine, and insisted on tradition.

Even if you have written thousands of lines of Basic, you probably never asked yourself why it was that Basic

The HX-20. For business on the move.

In today's fast moving business world, your information has to move with you. Over the past few years there has been an increasing demand for a totally portable computer with the ability to meet so many challenges.

Epson, with over 20 years experience in designing and manufacturing high quality printers, have produced the HX-20, a precision machine with its own rechargeable power supply that can be used for just about any task within todays discerning business: from data capture to word processing, from card indexing to sales order entry. Communicating with other machines is no problem and the HX-20 is easily coupled to one of our fine printers. You can even link in another computer system by using an acoustic coupler.

Don't be fooled by its size, the HX-20 has all the software back-up you'd expect from a much larger machine and incorporates many "bigger computer" features – 16k RAM expandable to 32k with serial interfaces, a full size typewriter keyboard, it's own built in LCD screen and a dot matrix microprinter. A microcassette facility is available as an optional extra.

A complete computer that will either stand on its own or could be the obvious extension to your existing system.

More and more people are finding out just how big the small compact HX-20 is. Why don't you find out for yourself – you owe it to your business.

EPSON

Extraordinary product. Exceptional quality.

Epson (UK) Limited, Freepost, Wembley, Middlesex HA9 6BR.
Sales Enquiries: Freefone EPSON.
General Enquiries: 01-902 8892.
Telex: 8814169.

☐ Please send me full details of the HX-20.
☐ Please ask my Epson dealer to contact me.

Name ______________________

Position ______________________

Company ______________________

Address ______________________

____

Tel: ______________________

PCW 11•20

uses line numbers. They are there, you use them. And you probably never thought for a moment that you might manage without them.

In the new Tandy 100 (the hand-held thing I mentioned last month), Microsoft has taken the first steps towards abandoning Basic line numbers.

Normal Microsoft Basic uses line numbers for two purposes. First, as line labels — 'GOTO 123' means 'execute line number 123' and the interpreter would find the line just as quickly if you called it 'Jane' and said 'GOTO Jane'. And second, it uses the numbers as editing indicators: 'EDIT 123' means 'show me the line, and I'll give instructions to delete, insert, or otherwise change it.'

Now anybody who has ever used a Commodore computer will know that this is a stupid way to edit a line. Anybody who has used a text editor will know the same thing. All you have to do is move the cursor to the place, and either insert or delete until you are happy.

In the Tandy 100, the first big step has been taken, because when you say EDIT, the whole program is turned into an ordinary text file, and you can use the normal text editor to do exactly what a text editor does. You move the cursor to the offending places, and make changes.

Now the question you should ask yourself is: why use line numbers for editing?

In the old days when Basic was invented, the answer was simple.

People using Basic were students. They sat at Teletype printers, which were very slow, and were connected to a central computer, far away, shared with many other students. And on a Teletype printer, there simply is no earthly way to roll the paper back and alter the line above. And even if there was, you certainly couldn't stretch the paper and insert three new lines.

What you did was to type, carefully, until your whole program (you had worked it out with a pencil) was in. You would try RUN, and it was full of bugs, naturally, so you typed LIST. Ten minutes later, you had ten feet of program listing next to you.

Obviously at this point, it was somebody else's turn with the terminal, so you went back to your classroom, and started working slowly through the listing. You would find missing lines, and would want to insert them at the right place, and you would find mistakes, and would want to edit them. So back you would go, and would type line numbers to tell the editor where you wanted the changes.

And after you were sure you had it right, you could LIST again. If you were still wrong, and found that you needed 12 new lines between ten and 15, you could RENUMBER.

On the BBC Micro and the Tandy 100, this is silly. If you change the stuff on the screen, you are changing the stuff in the memory.

Tandy, unfortunately, is caught neatly between the two stools.

You can edit your Basic program with a text editor, but there is also an ordinary Basic line number editor. And as soon as you come out of the text editor, you are back in the line number editor.

Line number editors are nice and traditional, but they really do need two things — an AUTO command, to save you from forgetting to type them — and a RENUMBER command, so that when you run out of numbers between the lines, you can make more room. For some reason, the Tandy has neither.

If you have to turn line 100 into line 110, it's easy enough. But then you have to look right through your program to make sure that you don't have a 'GOTO 100' anywhere.

I hasten to insist that this is not a condemnation of the Tandy model 100, but I do warmly urge Tandy and Microsoft: either get rid of line numbers, or give us a RENUMBER command. Preferably, the former.

Wander around with one of these specially packaged Epsons over your shoulder, and you will probably be able to get into GCHQ, the Cheltenham spy building, to fix the microwave link to Moscow.

What you actually are meant to do with it, according to Norbain, is type (up to eight documents or 'textfiles'), then plug the special speaker into the phone mouthpiece, dial your central office, and wait for it all to disappear down the line.

The product is called MailTel, and the software alone costs £65 plus VAT. However, Norbain, an Epson dealer, will sell you the whole thing — briefcase, shoulder strap, acoustic coupler, software and the computer itself — for £777 plus VAT. That is for the system with the optional tape cassette built in, by the way.

Details on (0734) 752201.

Name-dropper

Just one short month after Imagine had to call Jumping Jack something else, and scant weeks after Ocean had to think of another name for Armageddon ('there turned out already to be four programs with that name'), software firm Mr Micro has fallen foul of a similar name problem. The company reports with a touch of bitterness that it 'recently received notification from Century Electronics' that it was in breach of copyright over a game called Hunchy. Mr Micro adds that it strongly and emphatically denies this.

'But in view of the high cost of fighting the legal action which the arcade company threatens, Mr Micro has reached an agreement with Century Electronics which will disappoint many micro computer owners and dealers.'

The agreement is that it will withdraw the program, destroy all copies, and pay Century a lot of money — simply because, it says, although the program was all its own work, it couldn't afford the legal fees to prove it.

In cases like this, if a company finds itself trapped with an unsellable program, I'm a bit puzzled as to why it doesn't just give it away.

There is, after all, nothing to stop me writing a game for my own amusement — providing I don't attempt to sell it. And I can't see how I could be prevented from giving another one to a friend.

There are computer clubs which would be delighted to use such programs as demonstration tapes, and the publicity produced might even help the software company get new programmers to join in.

Who knows: it might even stop the dog-in-the-manger attitude of some arcade games giants who design a game, do not produce versions for

popular micros, and expect to be able to prevent other people from doing it.

And if the law can prevent people from making copies, providing they don't purport to be the original, then the law needs changing fast.

Learning with Logo

Logo, developed in the 1960s as a children's programming language, may well become an established applications programming language with the announcement of Dr Logo by Digital Research.

Written in C, Dr Logo (some bright spark decided 'Doctor' was more commercial than 'Dr') can be run under any popular operating system. Currently available on the IBM PC, Digital Research plans to implement the language on a range of operating systems. Dr Logo features turtle graphics, screen-editing of procedures, comments and indentation, string-processing, full list processing facilities (in a broadly similar fashion to Lisp) and debugging aids.

Dr Logo sells at £99.95, the IBM version requiring 192k RAM, the colour graphics display adaptor and a single drive. Details on (0635) 35304.
Surya

Sinclair's flat screen TV

So Sinclair has finally launched his new flat screen TV. Measuring just 5½x3½x1¼in, it is half the size of its competitors and smaller than the average paperback book.

The machine was originally meant to sell at under £50, however, it looks as though Sinclair's costs are higher than expected because it is now priced at £79.95.

The main feature of the TV is the revolutionary flat screen which is produced by Timex in its Dundee plant. Most of the electronics to drive the screen are housed in one chip which is made for Sinclair by Ferranti.

The use of clever electronics has meant that the television can be used in virtually any country in the world that transmits pictures on the UHF band. The only major exceptions are France which uses SECAM and the USA which uses VHF for many of its transmissions. Sinclair says that there will be a VHF model available shortly.

Power comes from a flat battery developed by Polaroid which will give approximately 15 hours use, or from an external power source which is available for £7.95.

Anyone who wants to buy one of these machines will have to write to Sinclair because they are only available by mail order.
Peter Bright

JEC 8064 launch

Tashkl Computer Systems has announced the launch of its JEC 8064, a 6502-based machine with a Z80 card as standard to enable it to run both Apple and CP/M software.

The expansion ports are Apple-compatible, enabling Apple add-on cards to be fitted. The complete system, which includes Basic in 14k ROM, an 80-column card, Centronics interface, twin 5.25in slimline drives and a 12in green monitor, sells at £1080 plus VAT. Details on 01-904 4467.
Surya

Pac-Man goes to court

An historic trial begins on 24 October when Munchkin and Jelly monsters will be called to defend their honour against the legendary Pac-Man. Unlikely though it might sound this case is legal history in the making, and could well set a UK precedent over software copyright. Atari and Namco (the plaintiffs) claim, firstly, that they hold a copyright on the game Pac-Man, and, secondly, that Munchkin (produced by Philips) and Jellymonsters (Commodore) infringe this copyright. In law these two are completely separate issues, and both must be proven for their claim to be upheld.

There is no suggestion that either of the defendants have actually copied any code, but rather that they have used the same ideas. The problem is that although everyone is convinced that some type of copyright claim must be applicable to this kind of software, nobody is quite sure of the precise form it should take. Take this quote from Atari's original statement of Claim, 'infringing the copyright of (Namco) in literary, dramatic, artistic, musical, cinematographic and sound recording works referred to herein embodied in the electronic video game known as Pac-Man.'

In copyright terms this is equivalent of throwing the book at Philips and Commodore. It will be up to Mr Justice Whitford to decide whether any or all of these claims are valid.

The decision to start proceedings came at a time when Atari was basing its marketing on the games exclusively available for its machines — letting the software sell the hardware. Since then it has changed tack and begun to produce some of its games software for other people's machines to dissuade imitations.

Stop Press . . .
At the time of going to press the parties had just announced their mutual agreement to postpone the hearing. It now looks possible that the matter may never get to court.
Dick Olney

High hopes

'A dedicated wordprocessing system that will never become obsolete' — that's the claim made by Canadian-based AES for its 7000 series.

In a studied attempt to guarantee future market share (and, incidentally, make the consumer's job even more difficult!), a CP/M operating system is included giving access to a full range of business software — you can even run WordStar on an AES machine (but you'd want your head examining if you ever did). The 7000 series, described by marketing manager Paul Dunsford as the 'flagship of the AES line' brings one step nearer the time when 'dedicated' wordprocessing and microcomputing merge into one hardware package. IBM mainframe compatibility is another advantage of the AES machines.

Many different configurations are available for this Z80 based series which all have a second AES-800 chip lurking in their

For anybody with the odd £700 to spare, here is a television to connect to your computer. It also has a printer. It also has an audio output — what do you mean, you haven't got £700 to spare? Let me tell you, a £200 monitor won't give you a slow, fiddly thermal printer that will take nearly half a minute to print a page of Oracle, and it won't give you a four-inch woofer — oh, you've already got a printer?

And a hi-fi set? Well, there's gratitude for you! Philips goes to all this trouble to make a really astonishing white elephant, especially for home computer buffs . . .

bowels. A typical mid-range set up is the 7140, comprising screen, keyboard, 192k of RAM, comms board, dual floppies, 13in printer and line filter together with 16 software packages which can all be held on line simultaneously leaving ample space for page oriented text work. Price around £7500. For more information contact Paul Dunsford on (09327) 85631.
Jerry Sanders

CP/M made personal

CP/M may soon be available in ROM form on cheap home micros.

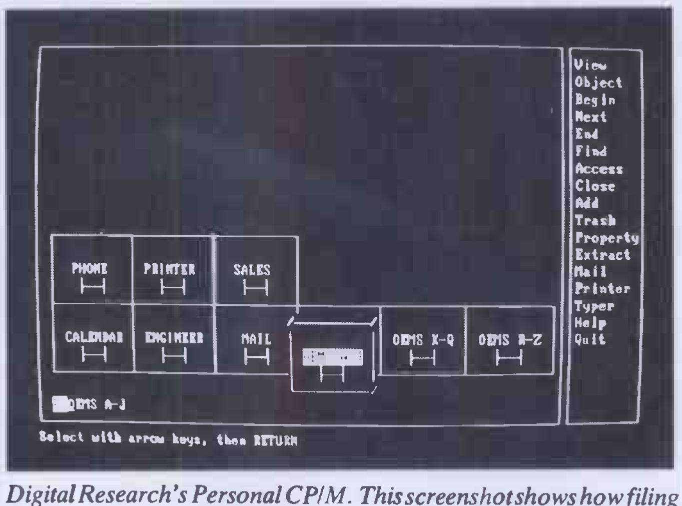
Digital Research, the company which produces the CP/M family of operating systems, has produced a friendly CP/M 'shell' known as Personal CP/M which it hopes to implement on a wide range of existing and future home and business machines. Digital Research said that it was 'safe to assume' it was talking to the manufacturers of all existing home micros.

Personal CP/M is menu-driven and uses Lisa-like graphical displays. The system provides help screens and prompt lines to guide the user through the operating system, and error messages are displayed in natural language rather than cryptic codes. Users of the OS will never need to see 'BDOS Error on A: Bad Sector' ever again.

Digital Research made the decision to store the operating system in ROM, rather than on disk, on two counts. The first advantage is that of memory. Personal CP/M obviously uses more memory than standard CP/M to allow for the menus, graphic displays and so on, and would eat into the user's RAM if it was loaded from disk. The second advantage is that with the OS in ROM, Personal CP/M could be implemented on non-disk based systems. Although a Disk Operating System without a disk on which to operate sounds a little unlikely, Digital Research has in mind such disk alternatives as CMOS RAM (*à la* Tandy Model 100), floppy tape drives (such as the Sinclair MicroDrive) and — at some point — bubble memory.

Kenneth Harkness, general manager of Digital Research's newly-formed Consumer Products Division, predicts that 3.5 million home computers will be sold this year and some eight million more in 1984. Digital Research is out to capture a significant percentage of that market.

Personal CP/M is compatible with Z80 and Intel 8- and 16-bit processors. Watch this space for news of the first home micro supporting Personal CP/M.
Surya



Digital Research's Personal CP/M. This screenshot shows how filing cabinet drawers containing data can be pulled out by the user.

Lisa price cuts

A more aggressive marketing policy by Apple UK has brought the price of the Lisa package (excluding printer and card) down by £1450 to £6500. A spokesman for the company said that this would give better value and price the machine 'in the context' of future 16/32-bit machines from Apple. Production came on stream sooner than expected in Cork so obviously stocks are beginning to build up but Apple UK has no plans at the moment to unbundle the software accompanying the package to make the machine more attractive to third party software users.

In the US Apple has decided to unbundle the software as well as cut system prices. Now, instead of having to buy a complete $10,000 system, a potential Lisa customer has four choices: buying the complete Lisa for $8190; buying the Lisa hardware alone for $6995 and finding or developing his own software; buying the hardware and one or more of the six applications packages; or buying the whole system and parallel printer and parallel interface card for $8490.

The timing of the price cuts could be of great benefit to Apple but really bad news for VisiCorp which intends to launch its Visi On products in October. It is expected that Visi On running on an IBM XT will cost between $7500 and $8200 for a basic system.

This is despite some growing concern that Apple was not shipping the Lisa in the numbers it had expected. A spokesman for the company simply said the pricing changes were made in accordance with an original plan and not because of any market pressures.

Responding to one report that Apple had only shipped 2000 of the machines, the spokesman said: 'I can't get overall figures but we shipped more than 2000 in the first month after the Lisa was launched.'

To cope with the expected increase in business, Apple has enlarged its marketing channels. It is now pushing the number of Lisa distributors to between 200-250 from the current figure of about 150 in the US.

With the last option, the customer is getting the Apple matrix printer for $300 as opposed to the previous price tag of $695 for the printer and the cost of an interface card.

As a six-pack the Lisa applications packages, or software tools, will cost $1195. Separately, the prices are:
LisaList — $195
LisaCalc — $295
LisaGraph — $295
LisaWrite — $295
LisaProject — $395
Lisa Draw — $395

But one problem with which Apple and its dealers will have to deal, is the complaint of those customers who bought a full priced Lisa just a few days before price cuts were announced.
Robin Webster

Slain Dragon?

Calling the Dragon 32 home computer a 'seasonal product' sounds like a convincing explanation of why Dragon Data got into financial trouble.

The company has been given a £2·5 million rescue package, according to the trade paper, *Computer Weekly*, and former managing director Tony Clarke is to step down 'for personal reasons'.

Probably the reasons for the sudden failure of Dragons to carry on selling the mad way they were selling before Christmas is more complex than 'seasonal' makes it sound. The fact of the matter is that the Dragon sold well over Christmas because you simply couldn't buy anything else. The BBC Micro supply was still a fraction of the demand. The Sinclair Spectrum was in the same boat. Commodore VIC had been withdrawn, and had virtually sold out before the company noticed how popular it had been and reintroduced it. People were so desperate for home computers they were even buying the Texas Instruments 99/4A.

Even at the time, people who bought the machine tended to notice that its colour display was not of the finest — there was a technical problem with the circuitry, which gave the beast a reputation of working with only certain television sets.

This was repaired in February, and things should have picked up then.

When the VIC came back, however, and the Spectrum caught up with its backlog, the Dragon lacked two things. First, it had no disk operating system, so nobody could supply disks for it. And second, it had virtually no software.

With the disks and operating systems which Tony Clarke insisted he expected to have in January, this powerful machine would have stood a chance in the BBC market for £500 level systems, where there were still more customers than machines.

It is easy for Dragon people to look back now and blame the price war, because the machine was made to look very expensive when the £200 VIC turned into a sub-£100 machine like the Spectrum. But the fact is: more expensive hardware (the BBC Micro) was still selling, despite all the many problems of which I have told you over the months — because it actually offered something for the money.

The new boss is a man called Derek Morgan, who is protecting the Dragon's lair while a search is made for Tony Clarke's successor.

If the new Dragonlord wishes to make something of the Dragon, he has to package a good disk operating system, a good business package (or preferably two) like a spreadsheet or a text editor, a good memory expansion system, and a range of games — probably five as a minimum. That all has to come free with the machine, or the price has to drop (and it can't).

Incidentally, by 'a good memory expansion system', I don't mean the 64 kbyte version launched recently. I mean a standard system of connecting 256 kbytes (minimum) in pages.

If you think the micro market is tough now, just wait till after Christmas this year.

Crossed wires

There is not a strict unanimity between WH Smith and The Games Network of Los Angeles over what exactly they will be using cable television for.

According to the Games Network, the system will use the first UK cable television circuits, and it will provide 'heavy emphasis on educational games and learning programs' as it sends software down the wire for householders to use.

WH Smith agrees about the cable TV bit, but has been telling the *Financial Times* that 'the games are usually those which are available in amusement arcades'. It adds that about a quarter of the games will be 'educational'.

The *FT* interpreted this as 'WH Smith to pipe Space Invaders into British homes', which won't have delighted The Games Network.

Whatever the balance of the software mix, the idea is brand new. It won't start happening until the middle of next year, and only in places where cable TV goes in, which will not be instant nationwide networking.

Supplied with the software pipeline, will be a 'console' — that is, a home computer — on which to play the games. No idea of price has been given at this stage, but in the US The Games Network charges a fee of $10 to $15 per month, including the console.

Intelligent questions

No doubt you could call it a 'key question' to ask 'What are micros?' when writing a report on their technical and market potential in the process industries. The Economist Intelligence Unit (EIU) asked this, and also asked 'What good are they, anyway?'

The answer, for those of you who are chemists in control of complex processes, is apparently encouraging: micros pay for themselves in eight months or so.

The full report is a mere £1000. However, it does come in two parts, one for micro users, another for micro suppliers — and for the user, the price is much lower, at £300. It's the market survey that really costs, at £900.

Details on 01-493 6711 from Robert Clark.

Robocom refit

The Robocom Bitstik graphics system has been totally rewritten since it was reviewed in November 1982.

Now written in machine code, this new version is considerably faster; for example, circle drawing is 43 times quicker. This recoding in a new structured format, while dramatically improving speed of drawing and library handling, is transparent to the user since the outward appearance of the package is the same.

While rewriting the program

". . . and when I leave the house, my pocket-computer keeps a look out for pickpockets".

Robocom has taken the opportunity to include some additional features which allow even the laziest of people to draw neat, accurate scale drawings. These new aids to accuracy include angled grids to help you draw angled straight lines and even angled locks to ensure you don't stray from these grids. Using these grids, objects can be drawn to any scale and then incorporated into larger drawings. Even if you make a mistake you can erase either single lines or the entire drawing.

Once perfect, your drawing can be printed on a printer or preferably a plotter. If you don't have a spare A0 plotter in your office, Robocom will print your drawing for a small charge.

Prices range from £445 for the Bitstik and software to over £6000 for a complete system (price depends on the plotter requested). Details from Robocom Ltd on 01-263 8585.

Tony Hetherington

Portable report

Predictions have been made that in four years' time, two out of three micros will be portable.

The report, by market research company Frost and Sullivan, insists that low-cost units, selling down to $55, will only account for a fifth of the money spent.

Sales of all 'portables', says the report, 'are projected to reach $8.4 million units by 1987, worth $3.1 billion (in 1982 value dollars, that is)'.

This is an important report (it costs $1275, so it had better be), because it looks like being rare beast, a genuine addition to existing knowledge. Most reports of this type are rehashes of what was learned over the previous year, with no relevance to what will happen next.

The only thing this report seems to lack is an understanding of how pervasive the portable will be. It rightly includes everything from the Basic-programmable calculator up to the Compaq imitation IBM as 'portable' but fails, I think, to consider the probability that by 1987, even desktop computers will have portable 'modules' attached.

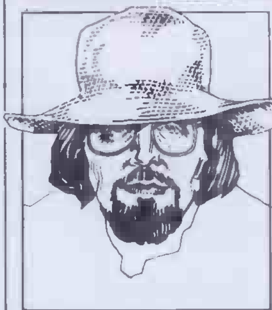
As an example of a prototype, one might quote the late lamented Grundy NewBrain. The plan was to have a CP/M system based on the portable keyboard. The keyboard, removed from the system, would be usable in the great outdoors, far away from electricity supplies, but when plugged back into its master console, would report on its day's doings.

One might also look at the way Tandy 100 users plug their lap-held portable into their home systems.

It doesn't take much ingenuity to foresee the intervention of radio, to enable the thing to report back without even going home first.

But at least this report has grasped the simple fact that, once the Osborne and the Kaypro had hit the market, any other way of designing a computer became an anachronism, like a car with the driver outside.

And the other thing it seems to reveal clearly is the fact that $4000 is going to be as much as people will pay for a microcomputer. END



A SENSE OF DUTY

Martin Banks wonders why the Government doesn't provide more incentives to domestic computer manufacturers and abolish antiquated tariffs on computer component imports.

The Lord giveth, and the Lord taketh away; that is one of the strange anomalies of life.

The 'Lord' in this particular context is that most blessed assemblage of Mafia entrance exam failures, the British Government (loud trumpets and much genuflection). To be fair, what I am about to regale you with this month is not all its fault; after all it did not give us microelectronics technology and all that followed on from it.

I will start with a statement made recently by our great Leader (of whom an acquaintance said, in all innocent honesty, 'she's the best man for the job'). She was making a guest appearance in Scotland, at one of the new companies in the microcomputer business. She glowed for the cameras and said that this (ie, all the new technology stuff) is where the new jobs lie.

And this is true, they do. The microcomputer industry, and its many spin-off activities, has the potential to absorb large numbers of those thousands now employed in not working at anything. In theory at least it is an industry that can absorb and use such numbers, if not the existing skills of the people.

But if the Government actually approves of these companies, and would like them to grow and prosper, what is it doing about the problem?

As is my wont, I will try to explain my point by way of a little story.

Once upon a time there was a company in Chesham called Nascom, and this company made microcomputers. In fact it made the first, under £200 computer kit ever and, once its early problems were sorted out, the cognoscenti tended to reckon it was a good machine, and great for the price. It was, however, a kit. This meant that those not skilled in the black arts of soldering could not take advantage of the machine. (There were some lovely horror stories around at the time which recounted the mess some people managed to make of this.)

As the Nascom 1 became more and more popular, the company worked at improving it. The enhanced machine eventually appeared as the Nascom 2 about 18 months after the launch of the first kit. Though still in kit form the company at last planned to service that growing band of people that wanted an assembled computer. The company investigated establishing an operation to perform this service here in dear old Blighty.

This was where the fun started, for the company did its sums and found that though it would have liked to have given the job to a British company and patriotically 'create jobs', it was cheaper to have the thing assembled in California.

To be fair, the company did not intend to set up its own manufacturing operation. Instead it intended to have the machines assembled by a third party company, so price was the crucial consideration. It did not intend actually to *be* the employer, but it did see the job as one which might be considered as beneficial in providing employment for others in another company.

So why was it cheaper to have the beasts assembled half way around the world in California and transported here? The short answer was, in a word, tariffs. There are a series of trade tariff barriers set between the European Community and the rest of the world that are intended to act as some degree of protection against the ravages of international trade. The idea is that if the Community has a trade or industry that could be wiped from the face of the earth by overseas competition, then that competition has a financial penalty set against it to reduce its competitiveness in the market-place.

'. . . the company did its sums and found that it was cheaper to have the thing assembled in California.'

There are thousands of these tariffs, all set to protect bits of our industrial base (and/or make a bit of extra money for the Exchequer out of our imports). A couple of such tariffs are relevant to this story. One is a tariff against electronic components, and the other is one against 'electronic data processing equipment' (computers to the rest of the world). These two tariffs have played, and continue to play, a significant role in the state of the UK microcomputer industry and carry much responsibility for the fact that some of our leading companies actually manufacture their machines abroad, rather than create jobs here.

What happens is that electronic components, and especially the integrated circuits that form the bulk of most microcomputers, have a 17% tariff placed against them. Complete computers, have a 6.5% tariff. The result is obvious.

As a high proportion of the unit cost of microcomputer hardware is in the chips that go to make it — the processor, memory I/O and 'glue' circuits — the cost of buying the components in this country (plus the tariff) adds up to more than paying someone abroad to make the machine and then importing it completed (plus a lower duty rate).

The final irony of this anomaly is that the tariff on electronic components ends up 'protecting' an indigenous semiconductor manufacturing industry that needs no protection at all. To show how really on the ball the Government is, the duty was never intended to protect the modern semiconductor industry, but the old UK electronic components industry, when it was trying to compete across a broad spread of product types from transistors to capacitors, resistors and switches.

Times have changed, however, and the tariffs haven't. The indigenous semiconductor industry is actually doing well. Having stopped trying to compete in general purpose bits and pieces it specialised, and the world has since beaten a path to its door. Ferranti, for example, is a world leader in gate array devices — ask Clive Sinclair, the ZX81 would cost twice the price, and the Spectrum would be a brute without Ferranti's devices.

The other tariff was set when men were men and computers were as big as the Matterhorn and twice as expensive. Anyone who could afford to buy one of those could afford the duty because, for them, money was printed by Waddingtons. Today it has changed totally. Computers are genuine consumer items and games programmers are getting to be like pop stars. Price is still irrelevant, but for an entirely opposite reason.

What is strange is that the tariffs continue to exist. Nascom complained about them years ago, and what was the result? Well, Nascom went to the wall and was taken over (OK, so it wasn't all the fault of the tariffs but I suspect they played a part).

What is interesting is that our cuddly Minister for Information Technology, Kenneth Baker, has at last decided to do something about doing something about it all. What is more interesting is that his move comes as a reaction to some weighty and concerted pressure from the industry itself, which is pretty good for a Government that came to power with the stated aim of creating the right environment for companies such as those found in the micro business.

The pressure came from the British Microcomputer Manufacturers Group

(BMMG) which was formed last year to support and promote the interests of the many small UK makers of microcomputers. Leading lights have been Comart, perhaps biggest of these 'small' companies, and Comart boss, David Broad, has been instrumental in getting the industry some sort of hearing with the Government.

Both the Group and individual companies have complained about the tariff-nonsense before, but now the Minister has decided to look into the problem. There is probably no connection between this and the fact that both Acorn Computers and Sinclair Research are seriously considering joining the group. If Maggie's digital knight is complaining, then maybe there is something to this problem.

Whatever the reason for the Minister's actions, it is to be hoped that they prove fruitful. It is hard enough as it is for any company to make, and continue making a good living for itself and its staff in such a cut-throat world market. It would be nice if the Government actually gave a hand now and then. END

A LESSON IN SELF~DEFENCE

Derrick Daines advises teachers on the pitfalls to watch out for when marketing computer programs.

It's a jungle out there! Just the other side of the classroom window is a rip-roaring, dog-eat-dog, desperate, snarling jungle full of tigers, hyenas, snakes and all kind of mantraps, deadfalls and pits. But what am I saying? It's worse — far worse — than a jungle, because the man-eaters have city suits and suave, persuasive voices; they conceal their fangs behind attractive offers.

The typical picture of a teacher as an idealistic, unworldly academic like Robert Donat playing Mr Chips is of course a stereotype, but there is this much truth in it: when it comes to business, the average teacher is an innocent. Why should it be otherwise? The teacher's business is teaching, not business. I don't think that I am insulting my colleagues when I say that many of us do not have a clue when it comes to money-making. Add to this a natural inclination towards altruism — why else should we put up with niggardly salaries? — and in the jungle of business, the teacher is a born victim.

The jungle has already begun to invade the classroom. In the business world of today, the single fastest-growing industry is electronics, and especially computing. Out of the world of computing, education is seen as having the greatest potential for business, with whole nations buying-in, as they clamour for expertise and know-how. The potential sales of hardware and software beggars description; it will be the biggest mass market in the history of the world. Next month I'll be giving you some facts and figures to support this.

In this mass-market, where does the teacher fit in? Why should he be wary of the jackals and tigers sniffing round his classroom? Simply this: the money-making animals know how to make money, but they do not know how to write

> *'In this mass market, where does the teacher fit in? Why should he be wary of the jackals and tigers sniffing round his classroom?'*

programs, nor do they have any real notion of what programs are needed in schools. For that, they need the teacher.

So, here we have a Robert Donat innocent, happy in his classroom and gently turning out a few programs for his pupils. He suspects that could he but market his programs, they would sell to other teachers. Get the picture? Enter the suave, 100-guinea-suited city gent. Before we know where we are, the teacher is fobbed off with, say, £50, or even £100, imagining himself a no end of a fellow, while the city gent laughs all the way to the market place and then to the bank.

Exaggerated? Don't you believe it! It's happening all the time! And it is going to get worse. As long as there is money to be made, there will be tigers ready to fight for it, however viciously, all in the name of business.

About three years ago I was privileged to try out the prototype of an attaché-case-sized computer that featured among other things a truly flat screen. It was a little beauty; light, easy to handle, with a good version of Basic. The two young men who had developed the machine needed cash to float a small company and approached one of our merchant banks, which in turn introduced them to an American financier. You can guess the rest. Inside a year, the American was flying back to the US with the only prototypes and the patents — everything — while the two inventors were signing on at the local Employment Exchange. They had not read the small print sufficiently well and had been out-manoeuvred all along the line. That story is tragic but true, for I know some of the parties involved. Similarly, the De Lorean adventure in Northern Ireland shows how even Governments may be out-manoeuvred by smart operators, so ask yourself — what chance does a provincial schoolteacher stand?

So how to cope with the jungle? First rule — headed notepaper and visiting cards mean absolutely nothing. Nowadays, I get mail almost every day from all over the world, and most of it is junk. One firm wrote to me from Cape Town; another from Singapore; another from Melbourne; and yet another from Sydney. They all want the same thing — programs suitable for education. Beware! Once the programs leave your control, there is no telling what may happen to them. Before you know where you are, that Cape Town pirate has copied your programs and is distributing them all over Southern Africa, and how are you going to know about it? You may be promised 10% royalties on sales, 20%, 50%, even 70%, but unless you know how many are sold, how are you going to know what value your share has? 'Sorry, the program didn't sell well at all, here's five pounds.' (That, too, has happened to an acquaintance, dealing through the main distributors for a best-selling machine — *not* the BBC.)

What happens with crooked 'program distributors' happens also with publishers. Right now, a rival British magazine is running a games competition, offering a £50 prize for the best game submitted. Big deal! For the massive outlay of £50, the magazine can expect to receive a hundred or more games; its tame programmers then get to work and knock them up into saleable items. You see it's not the

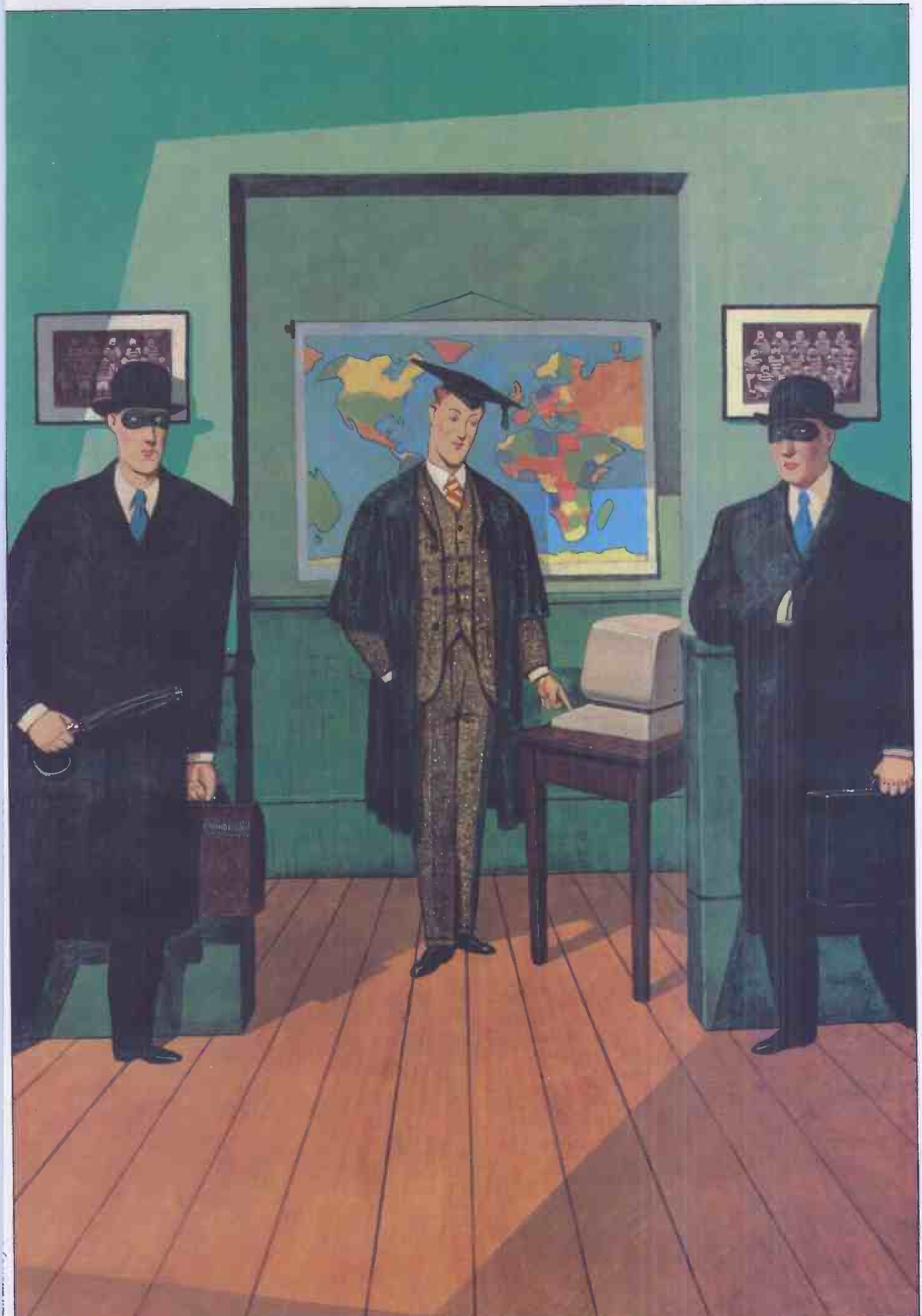
> *'Similarly, many teachers right now will be thinking of writing books and/or other articles about their classroom experiences with the computer.'*

programs and/or programmers which are in short supply, but the *ideas*. When you sell a program you are selling an idea; and it is ideas men who are in short supply. The teacher in the classroom is the one with the ideas — don't sell yourself short!

Similarly, many teachers right now will be thinking of writing books and/or articles about their classroom experiences with the computer. The same warnings apply. Once you release your manuscript to an unscrupulous operator, there is no telling what may happen to it. For all you know, it may be on its way to Singapore or Hong Kong, to be printed and sold there without your being any the wiser. You don't even get a brush-off with a pittance: you get nothing.

As with big tigers, so with the hyenas. You have a program or two for sale; what do you do with a fellow-teacher who asks to see your program on approval? You know that if he wishes, he could make a copy of your program, send the original back and claim that it wasn't what he wanted. Having been caught like that myself, I have sent out inspection copies with a few deliberate bugs included, buried as deep as time will allow. I also have had the words 'Inspection Copy Only' thrown onto the screen from time to time, realising, however, that should such inspection copies get into the hands of unscrupulous teachers, such protection will be removed. Latterly, I have simply refused to send inspection copies.

What protections are there? For the provincial schoolteacher with a few programs to sell, the best move is to get into the fold of a firm with a name to protect. Despite all that I have said above, there are



IT TAKES FLEXIBILITY AND PRICE TO PRODUCE CLEAR WINNERS.

This is the new Decision Mate V from NCR.

Designed and manufactured in Europe, it's a high performance micro-computer specifically developed for the business professional.

It offers all the processing power, versatility and reliability of much larger and more expensive systems.

At the same time it is easily installed, simple to use and can be upgraded as and when required.

The Decision Mate V is the first of a family of NCR micro-computer products providing maximum functions at the lowest possible cost.

The basic Decision Mate V features 64 K of memory, upgradable to 512K, high resolution monochrome or colour video display, dual 5¼" floppy discs, upgradable to 10Mb and a dedicated graphics processor.

The detachable keyboard is light, low-profile, multi-language and has 20 programmable function keys.

The Decision Mate V processor can be upgraded from an 8 bit to an 8 and 16 bit dual processor.

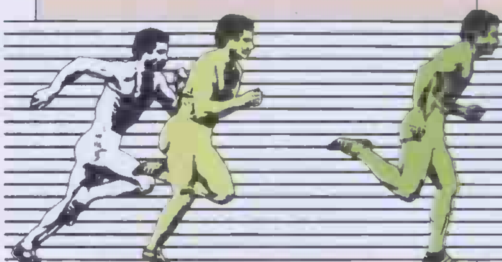
This enables the user to not only select from the large range of established 8 bit software but also ensures compatibility with the expanding range of 16 bit software.

To further enhance the Decision Mate V we're introducing Decision Net, a local area network, which will link up to sixty three micro-computers sharing expensive peripheral devices.

All of which adds up to a very flexible unit and, when we tell you that the basic Decision Mate V costs well under £2,000 it's not hard to see why we call it a clear winner. Every time.

Contact the Independent Marketing Division of NCR at 206 Marylebone Road, London NW1 Tel: 01-388 8440

THE DECISION MATE V
a clear winner from
NCR



A LESSON IN SELF-DEFENCE

many honourable firms in the market — those with national or international reputations, especially — and these will offer a fair deal. Then there is MEP (Microelectronics in Educational Programmes), which may be willing to consider new programs of quality. Whatever you choose, get agreements in writing.

I am willing to give names and addresses under private cover to any teacher seeking further help and guidance.

Two months ago (September *PCW*) I wrote from the other side of the desk; asking what professional constraints we should place upon ourselves when viewing other people's programs. This month I have written about the small supplier's problems. It all goes to show what a thorny topic software provision is, but in no way helps the teacher who is simply and honestly seeking good programs for his pupils.

Consider, we have suppliers reluctant to send out inspection copies, and potential buyers reluctant to buy unseen. A classic stand-off. The only solution is by recommendation. Many Local Education Authorities (LEAs) are setting up software libraries at which teachers may view suitable programs. Such Software Centres are run by honourable people who will not allow copying, so suppliers are happy. Teachers can view programs before buying, so they too are happy, but there are problems. Firstly, far too many LEAs do not provide any similar Centres yet, although I believe that they will spread. The MEP Centres provide a similar service, but they are too thin on the ground, with one Centre typically serving four or five counties. This brings up the second problem: many teachers have much too far to travel in order to reach a Centre, and certainly do not wish to travel after a day's teaching. Courses are a poor solution, with the market moving so fast, for any programs demonstrated at a course are out of date within a few months. Let us also remember that some 80% of teachers never attend courses.

Another solution being prepared in Nottinghamshire is the provision of a library bus that will contain a few computers and all current programs. The bus will drive into the school yard, hook up to the nearest mains point and then be able to demonstrate the best programs to the school staff. Even this solution is inadequate. Given the number of schools in the county, such a bus would be able to spend only half a day per year at each school, at best.

This is where the reputable national companies help enormously. Most employ large staffs of salesmen able to visit schools and generate sales, although of course they peddle only programs marketed by their own firms.

The various MEP and LEA centres are working towards an attempted cataloguing of programs available, with frequent updates, as there are various policies in operation. Some centres will give advice on quality and program application, while others take the view that they cannot dictate to the teacher and so leave out all comment.

Finally, an interesting commercial venture is under way with the impending publication of *DOES — Directory of Educational Software*. This massive volume will be distributed free to all schools, with a termly supplement. The *Directory* will group programs under various subject headings. Each entry will contain brief program descriptions, prices, source, and so on, the whole thing being paid for by advertisers who will pay for half a page or a page within the *Directory*. It is an interesting idea that will depend considerably for its success on the accuracy of the information that it contains. Write to *DOES*, Triumph House, 189 Regent St, London, if you are interested either as an advertiser or as a program supplier.

A similar venture is in hand at Tecmedia of Loughborough, the firm responsible for the highly-successful Micro-Primer Pack. It is intended to produce a catalogue of software and all sorts of consumables pertaining to educational computing — printer ribbons, paper, books — that sort of thing, with available software listed, too. Write to Tecmedia Ltd, Loughborough, Leicestershire. END

SOFTWARE

WHICH SPREADSHEET?

LOTUS 1-2-3

Mike Liardet evaluates an all singing, all dancing spreadsheet system, which has been a top seller in the US since its release.

The three cornerstones of the micro-software industry are wordprocessors, information managers and spreadsheet systems — there must be very few disk-based micros without at least one of these 'big three' in regular use. In spite of this it is still comparatively rare to find a big name in the software world offering all three of these products. (One notable exception would be MicroPro, which for some time has offered Datastar and Calcstar along with WordStar). It is even rarer to find these three products completely integrated with one another.

Anyway, over the last few months I have been subjected to persistent rumblings from various contacts in the trade, no — not caused by heavy lunches, but by the excitement generated over a new spreadsheet system which manages to integrate all of the big three functions with graphics thrown in for good measure. Called Lotus 1-2-3, this product has turned over $12 million in its first six months in the States, and is now poised for a similar onslaught of the UK market.

Basically Lotus has managed to produce a sort of software Holy Trinity. Unlike, say, MicroPro's offerings, we are not faced with three distinct products which, somehow or other, can be made to link with one another — we have a single product that can be used in three different ways. In fairness to 1-2-3's future rivals (there are none at present!), we should point out straightaway that 1-2-3 is rather weak as a wordprocessor although great enhancements in this direction will be arriving early next year. In fact Lotus prefers to proclaim the spreadsheet-graphics-information management aspects of the product, but nonetheless it can be used for simple text processing.

Readers can certainly look forward to more products of this nature in the months to come: Apple's Lisa and VisiCorp's Visi On, although not yet available, are nonetheless pointing the way for the future. Incidentally, Lotus has got there first, with its admittedly less ambitious offering produced in less than 18 months and with just a six-man programming team — in stark contrast to Apple's putative 200 man years for the Lisa software.

Readers who are primarily interested in information management or word processing software should bear in mind that 1-2-3 is first and foremost a spreadsheet system. Although it has extra facilities, the basic environment is that of the spreadsheet, and so obviously it is not the very best option for exclusive word or information processing. But whichever of the 'big three' you are interested in, 1-2-3 makes it very easy to ignore completely the bits you do not need. And the whole package is not so extortionately priced (£375) that this seems particularly useful.

Only one more point before we launch into the evaluation itself: Lotus has unfortunately gone along with the current American obsession with the IBM PC and not (yet) bothered to implement it for anything else — no problem over that side of the Atlantic, but all the Sirius and other 16-bit micro owners here are going to need a little patience.

Boxing — IBM-style

1-2-3's packaging is definitely designed to blend in with IBM's. A single stout manual is provided in, yes, you've guessed it, an IBM-style library box: very similar size, proportions and colour scheme. Fashions in software packaging seem to change more rapidly than those in the rag trade. I can now report that IBM-style library boxes are definitely *de rigeur*, whereas simulated leather ring binders, spiral bindings and other archaic paraphernalia are simply *passé!*

'Basically Lotus has managed to produce a sort of software Holy Trinity. Unlike, say, MicroPro's offerings, we are not faced with three distinct products . . . but a single product that can be used in three different ways.'

Apart from the manual, the box contains a quick reference booklet, a plastic function key template, three master disks and one backup disk. The three master disks respectively contain the core of the 1-2-3 system itself, the graphics software and various tutorials. Only the 1-2-3 system disk is uncopiable, and so a backup is provided for it.

Getting started

Lotus has placed the startup instructions right where I like to see them, on the first page of the manual, even before the contents page. And just in case anybody has any trouble finding them, the instructions are clearly labelled with 'Read This First'.

The two or three pages following give you all the information you need when you have first opened the package, including a contents list, minimum hardware requirement, and basic installation details.

Since 1-2-3 is produced exclusively for the IBM PC, installation is very simple and there is no need to set up VDU configurations or whatever before startup — it is all ready and waiting to roll with the PC configuration. (Incidentally 1-2-3 will also run on the IBM-compatible Compaq, but not on the supposedly IBM-compatible Hyperion — Hyperion is apparently commissioning Lotus to implement a compatible version to be released shortly).

For each of the three disks provided (plus the backup disk of the uncopiable core of the system), it is necessary to run a program called INSTALL. This merely transfers the operating system from the DOS disk (originally provided with the PC) onto the Lotus disk itself. As with most packages 1-2-3 could not be sold with the operating system already installed, since this would be an infringement of copyright.

Once this initial chore is complete, taking all of three minutes to perform, the whole world of 1-2-3 awaits. A particularly noteworthy feature of the software is the cryptically named Lotus Access System. To run it, simply type "LOTUS" and all the data disk formatting, copying, and other startup or occasional activities can be performed by menu selection at the touch of a button. There is absolutely no need to wrestle with the intricacies of PCDOS, since everything you need is handled by the Access System. Finally, having formatted a data disk, and made copies of the two copiable disks, you are ready to start. Of course the Access System has facilities for running the various 1-2-3 programs, and you simply select 'run 1-2-3' on the Access Menu to get started right away.

Spreadsheeting

As we have already noted, 1-2-3 is primarily a spreadsheet system, so I was particularly concerned with evaluating this usage of it. The initial display looks comfortingly like a spreadsheet, consisting primarily of the highlighted row and column headings, with a great empty space in the centre of the screen, just waiting to receive the spreadsheet data. One cell in the spreadsheet has special significance. It is displayed highlighted. This is the current cell where all data entry and modifications take place. The location of the current cell can easily be changed using the four arrow keys on the PC keyboard. These cause its location to shift in the appropriate direction, and attempts to move off the edge of the screen cause the whole focus of display to shift accordingly — all fairly standard spreadsheeting.

Moving around the spreadsheet in this fashion would eventually establish how big it is, but in fact it is so big — 2048 rows by 256 columns — that it is quicker to look up the vital information. Of course, as with most spreadsheet systems, it is not possible to enter data in each and every cell — all the RAM memory gets consumed long before that, even with a PC at full RAM capacity.

Following the usual convention introduced, by VisiCalc, the rows are identified by numbers, and the columns by letters (A, . . .Z, . . .AA . . . IV). Thus the top left-hand corner has coordinates A1 and the bottom right-hand corner is IV2048. Naturally it is possible to jump huge distances at one go. Simply push the relevant PC function key (there are ten function keys on the PC and the plastic template supplied by Lotus identifies the function each performs) then enter the coordinates.

There are a few other keystrokes for moving around the spreadsheet: paging up, down, left and right, home, end of line and, in short, everything you could reasonably hope for in this respect.

Entering text, formulae or numbers is achieved by 'moving' to the cell to be affected and then typing whatever is required there. The whole spreadsheet is instantly recalculated after each entry. There is not generally any need to inform 1-2-3 what type of entry is being made, it can sort that out itself. However, if we want to start text with a number (eg, '26th Jan'), then we simply prefix the entry with the quote keystroke. For most text entry this would not be necessary.

Formulae are built up in the usual spreadsheet fashion, eg, "A1 + A2 * A3", "99*@COS(DF99) — @PI", etc. The '@' symbol has no special significance, but is used to precede all the special built-in functions. In fact there is a huge range of these functions including: trigonometry, logic ('if's, 'true's and 'false's), financial (eg, net present value), statistics (such as standard deviation) and date facilities. The date functions are particularly interesting since they can access the PC's internal clock and also be used for precise data calculations (eg, number of days elapsed between 5th Feb and 29th July).

Most spreadsheet 'models' have an underlying pattern where, for example, all the calculations in one column have the same logic as the adjacent one. Thus most spreadsheet systems have a 'replication' facility so that only one column need be set up and then copied into the required number of adjacent columns. 1-2-3 is no exception, and provides excellent replication facilities, circumventing a lot of laborious retyping!

Using 1-2-3's replication introduces us to the 'commands'. Since the way the command menus work is the same for all operations, I shall first look at the way they work in general. Simply pressing the slash key ('/') reveals a command menu on a single line at the top of the screen. This menu has nine options, each starting with its own unique letter. The options include 'Copy', 'Quit', 'Print', and so on. One of them is highlighted, and a brief elaboration of what it does is displayed below. If we push the PC "ENTER" key this option is selected (and may lead to a sub-menu working along the same principles as the main one, and so on). Alternatively the left and right arrow keys may be used to flick the highlighting on to the next or previous options, of course instantly changing the elaboration information below — thus it is very easy to determine what each option does, without recourse to the manual. In fact there is also a powerful 'Help' facility that will give you even more information. Pushing the 'ENTER' key always selects the highlighted option, but once you are familiar with the options you will probably find it quicker to simply press the initial letter of the option you want. Moreover 1-2-3 remembers what options you chose

Fig 2

	jan	feb	mar	apr	may	june
num sold	23	45	32	14	54	32
price	$33.00	$33.00	$33.00	$33.00	$33.00	$33.00
val sales	$759.00	$1,485.00	$1,056.00	$462.00	$1,782.00	$1,056.00
cost70%	$531.30	$1,039.50	$739.20	$323.40	$1,247.40	$739.20
overhd	$200.00	$200.00	$200.00	$200.00	$200.00	$200.00
profit	$27.70	$245.50	$116.80	($61.40)	$334.60	$116.80

july	aug	sept	oct	nov	dec	tot
44	24	63	23	34	54	$442.00
$38.00	$38.00	$38.00	$38.00	$38.00	$38.00	
$1,672.00	$912.00	$2,394.00	$874.00	$1,292.00	$2,052.00	$15,796.00
$1,170.40	$638.40	$1,675.80	$611.80	$904.40	$1,436.40	$11,057.20
$200.00	$200.00	$200.00	$200.00	$200.00	$200.00	$2,400.00
$301.60	$73.60	$518.20	$62.20	$187.60	$415.60	$2,338.80

Fig 1

LOTUS 1-2-3

on a previous 'visit' to a particular 'menu' and highlights it accordingly. As this is frequently the one you want, 1-2-3 is really making life as easy as possible for you!

Doing a replication involves selecting the 'Copy' option on the main command menu and then specifying what it is you want to copy and where you want to copy it to. You can specify the source and destination for the 'copy' by either typing in the relevant coordinates or by 'pointing' to the cells you want by simply using the arrow keys. Any cell reference in a formula is copied in a relative fashion, unless it was originally entered as an 'absolute' reference. Absolute cell references include the '$' symbol — for example a formula reference to cell B5 would be modified according to where it is copied, but "B5" would remain unchanged wherever it was copied. It is possible for cell references to be absolute in one dimension (row or column) but not the other. Thus 1-2-3 can also cope with $B5 or B$5 references.

The facilities described so far were sufficient to run the spreadsheet Benchmark tests, and in fact 1-2-3 performed them all very well. Now that 16-bit micros are coming of age and RAM is becoming increasingly cheap, we should be looking for spreadsheet software that works creditably in a million bytes of RAM or so. Software that is even a little bit on the slow side will just grind to a halt when faced with a megabyte of data to recalculate. 1-2-3's time of 54 seconds to recalculate 370 rows of the Benchmark, on a 320k PC, makes it the fastest number cruncher reviewed so far, and it would almost certainly be feasible to use it, without excessive delays, on a fully RAM'd PC (although I was unable to test this).

An interesting facility introduced by Lotus is the 'macro' facility. Basically it is possible to predefine a sequence of keystrokes, and then invoke the entire sequence by a single keystroke. This facility is particularly useful for dealing with complicated file loading sequences, or for setting up tricky spreadsheet manoeuvres for lesser trained personnel, perhaps. Actually 1-2-3 macros are even more powerful than this since it is possible to use 'conditional branches' and other devices — in short to develop 'programs' in the 'language of 1-2-3', furtively turning the advanced user into a programmer!

In addition to the facilities already covered 1-2-3 has a full complement of the usual bells and whistles; everything you would associate wih top quality spreadsheets such as Microsoft's Multiplan or VisiCorps's VisiCalc. Column widths can be varied, cells protected, screen split in two, models split, merged and printed, and also a variety of different data file formats are supported including VisiCalc and DBase II.

Any features missing? Well, I was unable to find a facility to display the amount of workspace unused, certainly this information was not incorporated in the normal status display. A minor irritation was that I was unable to stop 1-2-3 printing in mid-print. Obviously this can be annoying if you have just set it off on a long printout only to realise you have done something wrong, but also graphics printing (see below) is necessarily slow, even for small amounts of data, and I could discover no way to interrupt that either. Only one other fly in the ointment: clearing the workspace did not always seem to recover all available memory. I circumvented this problem by quitting then re-running, a particularly easy exercise since on quitting 1-2-3 you fall into the Access System, not the operating system — and re-running is therefore a single keystroke.

Graphics

1-2-3's graphics facilities are excellent. The user interface for designing the graphs is superb. And the printout produced by the IBM Epson is crisp and clear. A pat on the back all round — the graphics were a real treat to use!

Having got that over with (no, I'm not related to anyone at Lotus), how does this facility work?

Well, to check out the graphics facilities I set up a simple model (Fig 1), a classic 12 month financial calculation with totals, and so on. As you can see the numbers sit lifelessly on the page, just waiting to be graphed!

1-2-3 provides options for plotting five different types of graphs: line graphs, bar graphs and pie diagrams, as well as mathematical and stacked bar graphs. Stacked bar graphs are like ordinary bar graphs, only each bar might be composed out of several smaller bars, shaded or coloured differently. Each sub-bar might be sales figures for a particular product, and the whole bar would be total sales. The mathematical graphs (called XY graphs by 1-2-3) are like line graphs only they are created from pairs of X-Y coordinates and not just from a list of Y-values. Most financial graphs are defined for fixed and regular X values (eg, the 12 months of the year) and the X information is not needed for plotting them, but more mathematical graphing generally requires that both coordinates be supplied.

Before a graph can be viewed it is necessary to go through a certain minimal set-up procedure. First of all 'Graphics' must be selected from the main command menu, then the type of graph specified, by using the relevant option of the sub-menu. Up to six sets of data can be plotted simultaneously on the same axes, and of course a range of values are needed for each. The sets of data are denoted A to F, and once again by a simple process of menu selection: first 'A' can be chosen and its range of values pointed to, using the arrow keys, and then 'B' is chosen, and so on. Of course if any of A to F are unspecified then they are ignored in the plot.

Having specified a pie diagram, and the 12 profit figures of Fig 1, I simply pressed 'V' for 'View' and was treated to the display in Fig 3. Printing this graph was a little more tricky since the 1-2-3 graph printing software is on another disk, and it is necessary to save this graph image before

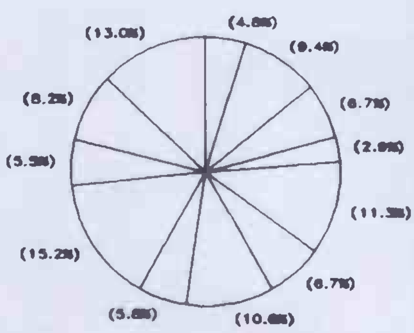


Fig 3

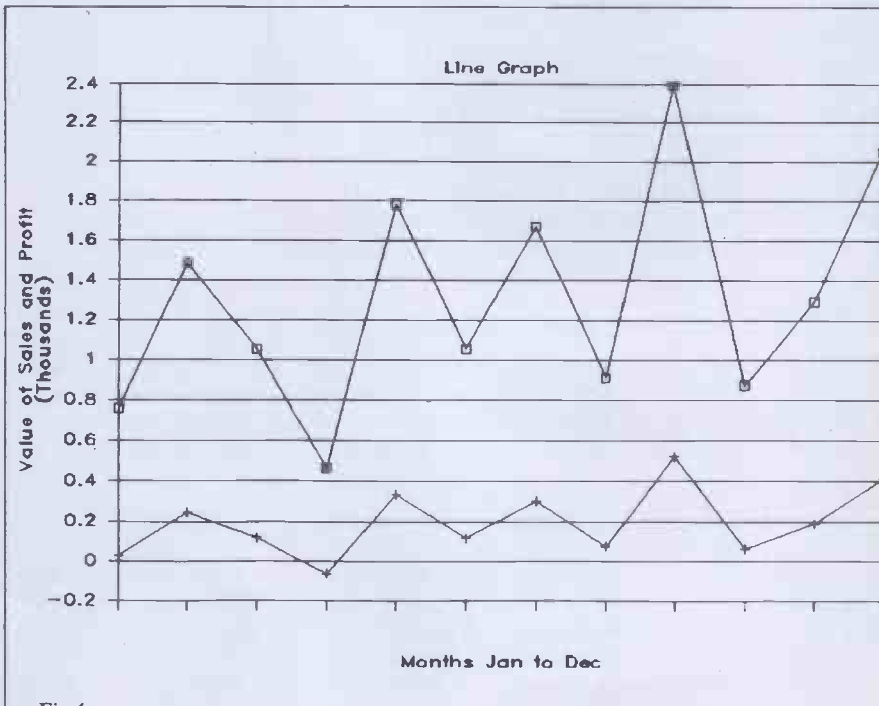


Fig 4

quitting 1-2-3 and changing program disks — more on this later.

To view other types of plot, simply change the plot-type required and 'View' again. All other values set up are still remembered. Making things a little more tricky, I set the ranges on A, B and C to the 'num sold', 'val sales' and 'profit' rows and was instantly viewing the bar graph in Fig 2. 1-2-3 performs the scaling and layout of the graph quite automatically, although it is possible to override its defaults if you want to. Notice that the negative value for April's profit is coped with without incident.

As an example of a line graph, refer to Fig 4. In this instance the upper line plots the value of sales, and the lower line plots profit, but various titles have been added. It would also have been possible to add the month names along the X-axis, redefine the symbols along each line, and all sorts of other things besides, but it is impossible to show the whole scope of this software in one short article. Of course this figure was actually reproduced from a printout, not a photograph of the screen, And it actually also illustrates a few features provided by the graph print program.

To print graphs it is first necessary to save their image in a data file, then quit 1-2-3 altogether. This is about the only grouse I can find in 1-2-3's graphics — it would obviously be preferable if the printing were fully integrated, but actually once you have the print program, running it is as easy to use as the rest of 1-2-3 and uses the same menu structure. Ordinary non-graph printouts are fully integrated anyway.

Among other options, it is possible to choose two different fonts from a list of eight for all captioning and marking of axes. The two fonts in Fig 4 are 'Italic2' and 'Roman1'. It is also possible to take advantage of a colour printer if you have one, using different colours for different lines, bars or whatever. Selecting option 'Go' sets the printer going (unstoppably, as I have already mentioned). Although a typical plot occupies only half an A4 page, it does take a couple of minutes to produce. This is because the amount of information needed for printing graphs is considerably greater than that needed for text, and this takes longer for the computer to process and transmit. The end result is well worth waiting for!

Information management

It is very easy to use 1-2-3 for information management, but the amount of information that it can handle is limited by the amount of RAM in the machine; not, as is usually the case with information managers, by the disk capacity. Nonetheless half a megabyte of RAM is no longer an impossible dream, and would have been quite a respectable size of disk only a couple of years ago, so it is possible to use 1-2-3 for some 'database' operations, as long as you do not expect too much of it.

Each record in a 1-2-3 database occupies one row in the spreadsheet and each field in the record being in a different column. Adding new records is achieved by inserting rows, using the normal spreadsheet insert-facility. Adding new fields is just as easy — simply insert a column. In fact not all information managers would permit the addition of new fields once a few records had been entered, but there is no particular problem with 1-2-3 in this respect.

Interrogating the database is achieved by a 'data query' command, which can cope with quite complex search criteria. The criteria themselves are simply set up somewhere in the spreadsheet. It is also possible to sort the records, on any one or two fields, for example, on name or name within department.

All the normal spreadsheet operations, row and column summing, and so on, are still available, and in addition 1-2-3 has some built-in functions, such as standard deviation of selected fields which are customed specifically for database usage.

Once you have some basic understanding of the way 1-2-3 works as a spreadsheet, it is particularly easy to start using it for setting up a database. All the spreadsheet skills still apply and it is simply a matter of learning how to work the query and sort commands, along with the special database functions if you need them. Certainly the simpler information management tasks can be handled quite adequately by 1-2-3, and it may even be useful as a test-bed for more complex tasks. Since the spreadsheet is always held totally in RAM, no matter what it is being used for, 1-2-3's database capacity is limited by the amount of RAM in the PC. It would also be difficult to cope with more than 2048 records since that is the maximum number of rows permitted in the spreadsheet.

Plus

The front of the manual lists 1-2-3's capabilities as: Spreadsheet (corresponding to 1), Graphics (2), Information Management (3) and finally Plus. Let's assume Plus is a synonym for text processing, the weakest of the four facilities offered by 1-2-3. If Plus actually stands for something else, then it would be an even weaker facility than the text processing.

If a long string of text is entered into a cell, 1-2-3 does not necessarily cut it short when displaying it. If the cell to the right is empty then it 'borrows' its space and writes on top of it, and so on to the next cell if necessary. This feature, useful for normal spreadsheeting anyway, allows the creation of lines of text. Editing can be achieved by using the normal cell-edit facility, and of course line insertions and deletions are also possible using the normal 1-2-3 row insert or delete.

Conclusions

For spreadsheeting, 1-2-3 can be numbered with the best. For graphics, it is superb. Add in the fact that it can also do smaller scale information management tasks and rudimentary text processing, and all these capabilities are totally integrated. Thus it amounts to a very powerful all round package. And if that is not enough then the extra-discerning reader may care to wait until early 1984 when enhanced wordprocessing, enhanced database and communications software are scheduled to become available. Will they then call it 1-2-3-4-5?

Thanks: To Digitus for the loan of a graphics IBM PC for the review. To Sof . . . (you know who) for the loan of 1-2-3. END

Benchmarks and other measurements

These tests were run on an IBM PC with 320k of RAM.

Spreadsheet size: 256 columns wide by 2048 rows.
Numeric precision: 15 digits.
Max column width: 72 characters.
Benchmark 1(a): Maximum rows accommodated: 370; (b) and (c) Recalculation time: 54 secs, ie, 7 rows per second; (d) Vertical scrolling: 6 rows per second; (e) Horizontal scrolling: 4 columns per second.
Benchmark 2: Max rows of text accommodated: 1210.
Benchmark 3: Max rows of numbers accommodated: 1380.

Checklist

Documentation: Substantial 350 page manual. Well indexed and clearly written. Quick reference booklet. Help screens.
User friendliness: Excellent. Very carefully thought out and easy to use.
Facilities: Extensive spreadsheeting facilities including flexible formatting, 'macros', spreadsheet manipulations, and large library of maths, statistics and logic functions. Extensive graphing from spreadsheet direct to screen or printer in colour or black and white with five different types of graph. Powerful (RAM based) database facilities for lower quantities of data.
Available on: IBM PC and Compaq. Hyperion and Sirius versions to be released shortly.
Price: £375 plus VAT.

BENCHTEST

ARGUS PPC

Control systems company Ferranti has made the transition from mini to microcomputers with its recently launched range of Argus Pro-Personal Computers. Tony Hetherington tested the PPC-10 and assesses how successful the attack has been.

Just over thirty-two years ago Ferranti manufactured the world's first commercially available computer, but then unable to compete financially with other major computer manufacturers the company sold out to a consortium which was later to become known as ICL. The agreement negotiated between these two companies prevented Ferranti from producing business machines for about fifteen years. Once free from this restriction Ferranti manufactured display stations for use with IBM and ICL mainframes. A development of this resulted in a display which would allow local processing using CP/M. The Argus PPC is a natural progression from that and has been built in conjunction with British manufacturer Future Technology Systems which designed and constructed most of the circuitry, including the main unit, which was then housed in a Ferranti case.

The name Argus Pro-Personal Computer, PPC from now on, emphasises the aim that the PPC should fit at the bottom of Ferranti's existing range of Argus minicomputers, used in process control, and marks the entry of a computer giant to the field of professional personal computing.

The Ferranti Argus PPC, a micro or a mini?

Hardware

The PPC has a normal 3-piece micro design with the monitor on a separate swivelling plinth. Each unit is the same sand colour with a light textured finish. But my first impression of the keyboard was that I had been sent the wrong one since it didn't seem to fit in with the 'building block' look of the other components, but more of this later. In fact you could hardly describe the PPC as a good-looking or particularly well-styled machine and I would recommend that Ferranti declines any invitation to enter it in any 'Miss Micro' competition, should the occasion ever arise.

I tested a PPC-10 which is at the bottom of the range of PPCs available. My configuration consisted of a processing unit containing 128k RAM and housing two 320k floppy disk drives, monitor and keyboard. Swapping the disk drives for 640k floppy drives transforms this basic unit into a PPC-20 while exchanging one of these 640k drives for either a 5Mbyte or 20Mbyte winchester disk drive completes the available range with the PPC-30 and PPC-40 respectively.

Main unit

The inside of the machine contradicts all I have said about styling as it is beautifully laid out. The main unit features multi-storey chippery with the main board extending across the whole of the base. Perched on top of the main circuit board on the left is the power assembly and, at the front, two of the quietest disk drives I have ever used. The main circuitry centres around the Intel 8086 16-bit processor running at 8MHz, which is surrounded by a cosmopolitan variety of chips. The 128k onboard memory can be expanded in 384k modules to a maximum of 896k.

My only concern about the interior is that, as the disk drive doors open and close, the stepper motors jostle some wires as they move up and down. This may in time work these wires loose, but they seem to be sturdy enough and are easily repaired should this happen. Any prospective service

Photography by Ian McKinnell

The function keys offer a combination of twenty six programmable functions which are used effectively in applications programs.

engineer will delight in the way that each of the 257 chips is numbered and is easily accessible, but he will need a good screwdriver since Ferranti seems keen on keeping everything firmly in place (the keyboard alone contains 23 screws!).

'Indeed the PPC is really a mini in micro's clothing and contains all the software needed to set up a fully-fledged computing department with security and hierarchical structure.'

Arranged along the back of the main unit are a large on/off switch (which uses binary notation 1 = on and 0 = off), a reset button, sockets for the keyboard and monitor, a large fan to keep everything cool and no less than three V24 or RS232 serial interfaces. This strikes me as being a little strange and I think it would have been better to swap at least one of these for a centronics interface.

Keyboard

As I mentioned above I don't feel the keyboard reflects the style of the rest of the PPC. It seems too flimsy. In fact one of its four rubber feet fell off — but this was quickly replaced and didn't happen again. There has been some attempt to colour code the keys with the notable exception of the CMND key, which is black; the rest are either tan for those found on a normal typewriter or cream for function, cursor and editing keys. The keys themselves have a light touch and all have auto repeat. This unfortunately instills a fear that you will duplicate characters at an alarming rate. Keys which are in almost continuous use are the normal size but have a larger base. This is unfortunately becoming a standard feature. However, I find these keys unpleasant to use and should you just miss the moulded part an error will almost certainly occur. These problems will be less accentuated once you get accustomed to the keyboard.

Above the standard qwerty keyboard are thirteen function keys and a command key. Together these offer a combination of twenty-six programmable functions. These are undefined on the raw machine but can be used to good effect in the various application packages. To assist here, there is an indentation above the keys in which a 'prompt card' may be placed.

The keys are nicely angled for ease of typing and the CAPS LOCK and SHIFT LOCK have red LEDs to indicate when they're engaged. The keyboard is connected to the main unit by an adequately long cable and a very secure connection so there's no worry about being disconnected mid-sentence.

The monitor

The monitor is a 12in monochrome display which has four rubber feet on which it can sit, tilt or swivel on the dome of the plinth

A sideways view of the PPC reveals the building block appearance.

supplied. The display, with or without the plinth, can be sited on top of the main unit, but the connecting cable is long enough not to make this essential.

When on the plinth the monitor can swivel, according to Ferranti, up to 26 degrees left and right, tilt down five degrees and up 15 degrees. Since the plinth can also be moved any prospective user should have no trouble in finding exactly the right angle required. The screen display is green on black behind non-reflective glass and is normally 25 lines of 80 characters, although this can be altered to 40 double width characters per line. This, along with other display functions, for example, character brightness, is controlled from the keyboard since the monitor has no external controls.

For graphics, the PPC relies on its offer of user definable character sets. Each of the 256 characters can be redefined using a pleasant piece of software. The screen is divided into two sections. The left-hand section is just a listing of all the characters as they are presently set, whereas the right-hand half contains two work areas. Using a cursor you select a character you wish to alter and this is placed in one of the two work areas. Each work area is a grid of 14 rows of eight boxes. Then you simply use another cursor to shade or clear each of the boxes which will make up the pixels which form the character. But be warned: the effect of changing a character is immediate, as I discovered when I tried to alter the space character. Luckily I realised

RS232, V24 ports galore, but no centronics!

what was happening before the screen went completely dark.

As well as having uses for specialist applications you can use this facility to change the style of the letters printed. The captial U is a little too angular for my liking and looked more like a V, but this can quickly be changed using this facility. The PPC has a resolution of 640 × 320 pixels.

System software

Getting started is quite simple on the PPC: simply plug it in, switch it on then wait. This delay, although quite small, is a nervous one, for the PPC is running through its test routine and if there are any errors it's now you're going to discover them. After a while the short but reassuring message 'Please insert a system disk' is displayed. Once this has been read the first of the PPC's security systems come into operation and you are required to sign in. Signing in involves entering your own unique user name and password; if any of these are incorrect then the PPC emits a loud bleep and you have to start again.

The PPC runs under an enhanced version of CP/M-86 which Ferranti has called F-COS86 which presumably stands for Ferranti Computers Operating System version of CP/M-86. Rather than outline every feature available I'll restrict myself to those features which differentiate F-COS86 from standard CP/M.

One of the major claims of F-COS86 is that the disk formatting and volume copy facilities operate at higher speeds than the equivalent CP/M-86 facilities. Naturally I was keen to test these claims comparing them with CP/M-86 on the Sirius. Formatting a single-sided disk on the PPC took 50 seconds whereas a similar disk took five seconds longer on the Sirius. This, although agreeing with Ferranti's claim, didn't strike me as being significantly faster. Comparing the volume copying wasn't possible in the time allowed due to problems in ensuring that comparable data was being copied on both machines. Nevertheless I had the feeling that it was indeed quicker.

Of much greater importance than the above is the fact that F-COS86 includes a friendly front end compared with the notoriously anti-social CP/M. This is achieved almost exclusively by the use of user menus. The advantage of these is that they are friendly and the user at any one moment knows exactly where he is, how he got there and how to get back. These menus are created using a program called Edmenu and the completed menus are stored on the system file Ftosmenu. Edmenu is easy to use being naturally menu driven and offers the facilities to create, amend or delete any menu or menu item. Each menu can have up to ten options (numbered 0-9) though option 0 is always 'Return to the previous menu'. Each option must be individually defined, with a definition consisting of an item number, a description to be displayed in the menu, an access code and whether the option results in the execution of a named command or leads to a sub menu.

F-COS86 also brings mini/mainframe style security to the micro world with the use of the user names and passwords, user system disks and access codes. Indeed the PPC is really a mini in micro's clothing and contains all the software needed to set up a

Each of the 257 chips is numbered and easily accessible.

fully-fledged computing department with security and hierarchical structure. Similarly this may be used to secure sensitive information in a smaller application.

The user names and passwords form part of a user's record which is created amended and deleted by the program Eduser which is similar to Edmenu in structure and function. Each user record along with the username and password contains an access range. This is a list of letters, which represents access codes controlling entry to menu options. Quite simply if the access code specified in a menu option definition isn't one of the letters in the user's access list then the user is prevented from using it. Not only is he denied access to this option; the option itself isn't even printed on the screen.

Ferranti takes this security aspect one stage further, and recommends that each user, or small group of users, have their own system disk containing only the software they will require. This conjures up images of a queue of people waiting to use the PPC each with their own disks held in their hot little hands.

But Ferranti thinks this won't happen since it envisages that an installation will have a number of PPCs all networked together and sharing winchester disk drives. The networking facility is still some time away, but when it finally arrives it will probably complete the PPC's metamorphosis from micro to mini. I say that because it is then that full use of these security measures will be made; however, presently they have only limited practical value.

The programs executable by menu options are of two main types: applications software and programs written by the user using M-Basic which is supplied with the PPC. M-Basic, is the fifth version of Microsoft Basic which, as those in the trade know, is a continuously changing language. Accurately this is release 5.0 as opposed to releases 4.0 and 4.51. All these release numbers are confusing to the relative newcomer, but put simply each new version is the previous one with a few corrections and additions. When these changes become major then the new version has a release number to reflect this, for example 5.0. Consequently this version has some major changes; some of which will be most welcome to past users of Microsoft Basic.

Gone are the fatal errors caused by dividing by zero and overflows. Also the notorious truncating and random numbers bugs have been cured. Variable names are now increased to 40 significant characters; this along with the addition of the WHILE WEND structure has taken the cause of structured programming further. Among other additional reserved keywords are CALL, which calls an assembly language program, CHAIN to call another program and COMMON to pass variables to it. The M-Basic is accompanied by its own user manual which is an excellent reference work. Supplied in an A4 ring binder the manual contains a section where a single page is dedicated to each Basic command explaining its syntax and purpose with full examples. However, I must stress that this is definitely a reference work and it would be unlikely to be of much use to anyone learning the language. Ferranti also included Digital's Personal Basic with the review machine, and is planning to replace M-Basic with p-Basic as its standard package, but since this is to be reviewed separately, all I will say is that this Basic is more suitable for beginners.

The task of distributing the software and deciding who can access what falls on someone Ferranti has dubbed the Systems Manager. So, in order to assess his task I set out to create a single system disk for a department with three users: Tom, Dick and Harry. The first stage is to decide each user's requirements to determine which software is required on the disk. For this I used the software available and decided that Tom is a Basic programmer and therefore needs M-Basic; Dick needs a suite of programs which run the Benchmarks; and all of them need to use the wordprocessor.

Having done that, before any of these programs can be copied into the new system disk, it must be created. This is a rather involved process and requires the formatting of a disk and then separately a system area; then the copying of the original system area and then five essential files using PIP. You could copy more files, for instance, Eduser and Edmenu, but since space is limited it's as easy to load the original system disk into the other disk drive when you want to set up users and menus. The main menu should then be altered adding an option for M-Basic, the wordprocessor and the Benchmarks programs. The M-Basic and wordprocessor options are command options and are specified as such, while the Benchmarks option leads to a sub menu which has a separate option for each Benchmark. Each of these is a command option which when selected executes the Basic program which forms the Benchmark. To cater for the security aspects, the options added to the main menu are given access codes. These access codes should be noted for inclusion in the user definitions which is the next task. Each user record is created with a unique user name and password and given an approprite range of access codes. Finally the application software is copied onto the new system disk using PIP thus completing the process.

As the saying goes: 'that's all there is to it.' Having set up a single disk for only three users I definitely wouldn't like to do too many more even though subsequent ones would be easier since the next time I shouldn't have to wade through two manuals to find out how to create a system disk.

> '. . . F-COS86 includes a friendly front end compared with the notoriously anti-social CP/M. This is achieved almost exclusively by the use of user menus.'

Benchmarks

BM1	0.7
BM2	2.3
BM3	4.8
BM4	5.0
BM5	5.6
BM6	10.2
BM7	15.7
BM8	12.7

All timings in seconds. For an explanation of the Benchmark programs, see PCW Vol5 No11, November 1982.

Other software

Ferranti's own range of software to run on the PPC includes Cis-Cobol, MS-Pascal, Supercalc and the F-text wordprocessor. I used the last of these to prepare this report.

The F-Text wordprocessor is supplied on disk with a manual and a prompt card which is placed on the keyboard in the indentation above the function keys to explain their use.

Using the procedure described in the systems software section F-text must be copied onto a system disk and incorporated into a user menu before it can be used. The F-text manual unfortunately assumes this has been done and launches more or less straight into operating instructions. The rest of the manual explains in detail the facilities available and the function key combinations required to use them.

F-text provides full text handling facilities and makes good use of the function keys. Thus it is easy to create, move, amend and delete lines or blocks of text. The cursor keys are used to position the cursor for editing or insertion and also for scrolling down through the pages of text. There are also four function keys; last disp, first disp, next disp and prev disp which display the corresponding screen of text. Unfortunately this page movement is restricted by the machine's onboard memory which on the review machine allowed about six pages. The effect of this is frantic disk activity when a next disp or scroll down is requested which would take the display beyond that held in the machine and to stop any prev disp action. After such disk activity to return to the previous page of text you must press the first disp option and then scroll down to the page you want. The find function also has this aversion to upwards travel and will only find the first occurrence of a selected word.

The F-text screen display is 80 characters wide although margin and tab settings can reduce this to any required width. Above the 21 lines of text are three lines of information to aid the user with his wordprocessing which contain column numbers, tab settings, the filename being edited and a function area where characters to be found and replaced are entered.

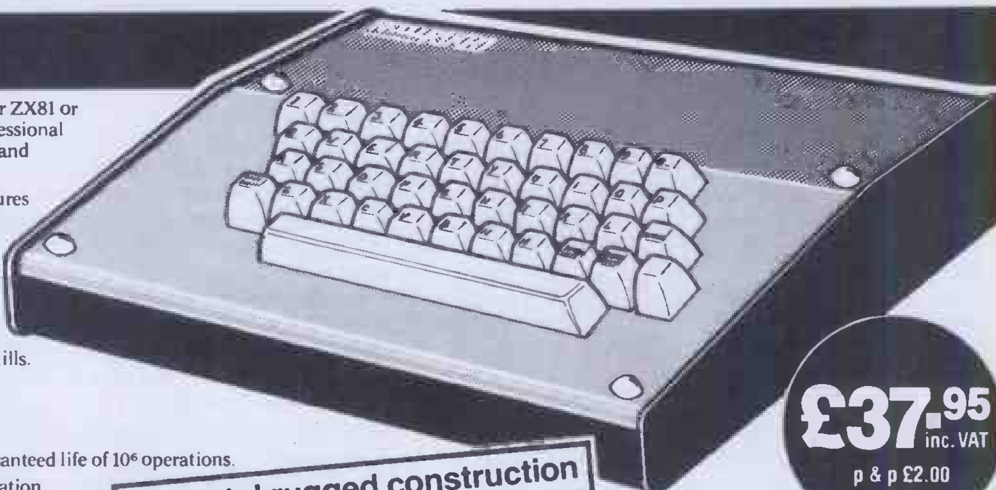
The F-text, along with the rest of the

ATTENTION ALL ZX81 AND SPECTRUM OWNERS

Introducing the new Ricoll compatibles

Guaranteed quality and reliability at sensationally low prices

Keyboard RIKB1



Just imagine how good it would be to turn your ZX81 or Spectrum into this attractive model with its professional typewriter keyboard (full 41 keys plus spacebar) and rugged all metal body.

It's not only good looking, there's a list of features beneath the gleaming black finish and the price shows how easy we've made it turn the dream into reality.

- Adjustable fixing of P.C.B. virtually eliminates the famous 'wobble' and provides a complete choice of add-on parts.
- Simple connection, no soldering, no special skills. All you need is a screwdriver and pliers.
- Complete with full instructions.
- Double shift key.
- Switches have gold-plated contacts and a guaranteed life of 10^6 operations.
- Ergonomically shaped front ensures easy operation.

Be sure to state whether ZX81 or Spectrum type required.

All metal rugged construction

£37.95 inc. VAT p & p £2.00

Sound Generators

RISG £29.95 inc. VAT p & p 75p — £27

RIFG £39.95 inc. VAT p & p 75p — £35

RISG

Now you'll be able to add those exciting sounds you've always wanted. Our new sound generator RISG, specially developed for the Spectrum is programmable to produce virtually any sound; animals, birds, explosives, bomb blasts, trains etc.

- Completely programmable.
- Uses the popular GI Chip AY3-8910.
- COMPLETE WITH DEMONSTRATION CASSETTE.
- Sturdy plastic case.
- Own speaker and amplifier.
- Fits neatly into the back of your computer - no soldering.

RIFG

Our super sound generator has everything that the RISG offers plus programmable high quality low pass, high pass, or band pass filter. This additional circuitry offers a much wider range and control of the generated sounds.

Additional feature: the provision of two 8 bit input/output ports.

★ Special introductory prices on generators until 31st December ★

Sound Generator Software

To help you get the most from your sound generator we've developed a more comprehensive cassette which offers a wider range of sounds. **£3·50plus 40p p&p**

16K RAM Pack RI161

Increase the power and potential of your ZX81 with our 'state of the art' 16k RAM pack. We've used the latest technology to reduce the number of I.Cs and give you better efficiency and improved operation.

- Very low power feature when used with our keyboard RIKBI, the dreaded 'wobble', overheating and memory loss become things of the past.
- Easily expandible to 32k by simply plugging in extra RAM chips - no soldering! See our special offer!
- Sturdy plastic case.
- Fits neatly into rear of computer.

'state of the art' technology

£22.95 inc. VAT p & p £1.25

Special Introductory Offer

If you upgrade to 32k within six months of purchase, we will supply the necessary chips for your RI161 at a special price of only £13.75 inclusive of VAT (p&p £1.00).

Buffered Motherboard

Of special interest to educational establishments and serious hobbyists

Eight slot expansion buffered motherboard for the Spectrum enables up to eight add-on boards to be fitted and operated with complete security.

Full data sheet available soon

RICOLL ELECTRONICS

Ricoll Electronics Limited
48 Southport Road Ormskirk
Lancs L39 1QR
Tel: 0695 79101/4 Telex: 627 827

Personal Callers Welcome

Please send me:- *(Please tick box to ensure correct type)*

- ☐ Keyboard RIKB1 at £37.95 plus £2.00 p&p — My computer is ☐ ZX81 ☐ SPECTRUM
- ☐ 16k RAM pack RI161 for ZX81 at £22.95 plus £1.25 p&p
- ☐ Extra RAM Special Offer for RI161 at £13.75 plus £1.00 p&p
- ☐ Sound generator RISG special discount price £27 plus 75p p&p
- ☐ Sound generator RIFG special discount price £35 plus 75p p&p
- ☐ Sound cassette £3.50 plus 40p p&p

I enclose cheque/P.O. payable to Ricoll Electronics total £ ....

Signature ____________

Name ____________

Address ____________

Post to: Ricoll Electronics Limited, 48 Southport Road, Ormskirk, Lancs. L39 1QR
Please allow 28 days for delivery

PCW/11/83

ARGUS PPC

Ferranti software, is supplemented by arrangements with two software houses, Software Ltd and Tamsys Ltd, which are preparing a range of software on PPC style disks. Although there are no contracts involved, these arrangements will result in a comprehensive range of software for the PPC including a myriad collection of word processing, statistical and financial packages.

Documentation

Two manuals are supplied with the PPC, an introductory guide and a F-COS86 operating system guide. There is also a large white card directing the new user to the introductory guide which is called the *Introduction to the Ferranti Argus Pro-Personal Computer*. This is an excellent idea since it helps the beginner to know where to start. Unfortunately, after such a good start the rest of the documentation is disappointing. The manuals themselves are A4 heat-bound books which give the impression that they are either going to remain self-closing or rapidly disintegrate. Both of the manuals have excellent 'scope of the document' and 'associated publications' sections, but this is outweighed by the lack of an index and a rather confusing system of page numbering.

The introductory manual is as titled, a simple introduction to the PPC. This deals in great detail with the make-up of the PPC and how to set it up. There is also a full page of siting instructions which tell you where to place your PPC for optimum life and performance. To summarise these, the PPC should be sited on a dust and dirt free firm surface away from windows, doors, radiators, kettles, brightly coloured walls and telephones. Such a location doesn't exist in our office and most users will find the search for one difficult. Perhaps Ferranti is suggesting that a computer room is what is really required. To be fair I must stress that these conditions are for optimum use and that the review PPC functioned perfectly well despite breaking most of those siting suggestions.

Having got the PPC connected up, you are then taken through standard operations — for example, disk copying and formatting. Finally, there is a section aimed at the Systems Manager delving into wondrous topics such as file generation and good operational practice. This all leads up to the point when you would expect a step-by-step guide of how to set up a system disk, but no such guide exists.

The operating system manual was obviously written by another person since it is written in a way which assumes that such an exercise was included in the introductory guide. Having assumed that, it then explains in sufficient detail how to implement those features described in the system software section. Unfortunately it is difficult to use as a reference manual since it has no index and the contents pages for each chapter immediately precede the chapters involved thus making them difficult to find. The page numbering adds to these problems since each chapter is numbered individually. So since there are three chapters there are three page fours.

The operating system manual also contains three appendices, one of which is a listing of the character sets with their hex codes. Unfortunately they don't include the hex codes for the function keys and cursor keys, and since these would be useful to programmers they are mentioned below.

Cmnd = 98 Function keys in order F1-F13; 97, AF, A0, A1, 80, 81, 82, 8F, AB, A7, 84, 87, 8A.
The cursor keys as from left to right on the keyboard; AE, 1E, 08, 0C, 03, 0A.

'It is at . . . professional users that the PPC is aimed rather than the small business user, although he will be catered for by the software companies.'

Prices

Argus PPC-10: 128k RAM, two 320k floppy disk drives, VDU, keyboard, F-COS86 and M-Basic. £2800.
Argus PPC-20: as above but with two 640k floppy disk drives. £3250.
Argus PPC-30: as above but with only one floppy disk drive plus one 5Mb winchester disk drive. £4420.
Argus PPC-40: as above but with one 20Mb winchester disk drive. £5595.
384k memory extension module. £950.
F-text wordprocessing package £455.

Technical specifications

Processor	8MHz Intel 8086.
Memory	128k expandable to 896k.
Screen	12in green on black, 25 lines of 80 characters.
Keyboard	Low profile full ASCII, numeric keypad and 13 function keys and a command key that doubles their effect.
Disks	320k or 640k floppy disk drives. Top of range models have a five or 20Mb winchester drive.
Interfaces	Three RS232 serial interfaces.
Operating systems	F-COS86, will run CP/M-86 and MS-DOS software.
Languages	M-Basic, P-Basic, Cis-Cobol, MS-Pascal.
Dimensions	Main unit 178mm high and wide and 433mm deep. Monitor 344mm high, 315mm wide and 330mm deep. Keyboard 65mm high, 420mm wide and 210mm deep.
Total weight	13kg (main unit) 8.5kg (monitor) 1.8kg (keyboard).

Installation and support

Ferranti's experience in the DP world is very much in evidence in its attitude towards installation, maintenance and user support. Should any user pay the installation fee then a service engineer will set up the PPC and show that it is in good working order. This service would also include a demonstration of the communications package should this have been purchased. Ferranti imagines that this service would be bought by those users also requiring a maintenance contract, hence early contact is made between the user and the service engineer who will then deal with any subsequent problems. This on-site maintenance is taken directly from its DP support experience, where the time a machine isn't working costs money. Since most of the PPC users will not require this urgency, a repair by return scheme is offered; however, the equipment must be sent to Bracknell or Manchester. Ferranti also realises that most users will just want to install their own kit and says that they are planning to offer training as an extra, which should overcome the problems caused by the manuals.

Conclusions

The Ferranti Argus PPC is an extremely flexible machine which offers a mini style operating system on a micro. This will endear the PPC to universities, research establishments and professional institutions where security and data integrity are important. It is at these professional users that the PPC is aimed rather than the small business user, although he will be catered for by the software companies.

The one major drawback with the PPC is that, being so flexible, it reaches the user in a raw state. It is then up to the System Manager to cook this to the user's tastes before serving it to him. This is indeed a mammoth task and it is unfortunate that the manuals are so unhelpful here.

Once I got the system running using a system disk that I had created, I found that the user menus made the PPC friendly and easy to use.

END

True or False: You Can Now Run Apple Software in Your IBM PC.

☑ True. Introducing Quadlink by Quadram. The revolutionary enhancement board that turns your IBM Personal Computer into an Apple-compatible system.

Quadlink. Simply plug it inside your PC, press a few keys, and instantly run virtually any Apple software package available.

Quadlink greatly enhances your PC's capabilities.

☑ True. Quadlink gives you access to the largest software library ever written. Business, educational, and entertainment packages. Software for any professional or home use. This means your PC can now do more than ever before. In more ways than ever before.

With Quadlink, there's no diskette reformatting needed.

☑ True again. With Quadlink you'll never have to worry about "compatibility." Just put your Apple diskette in the PC drive and watch it go. It's that easy. Like having an Apple computer inside your IBM.

And every Quadlink comes with that traditional Quadram Quality built right in.

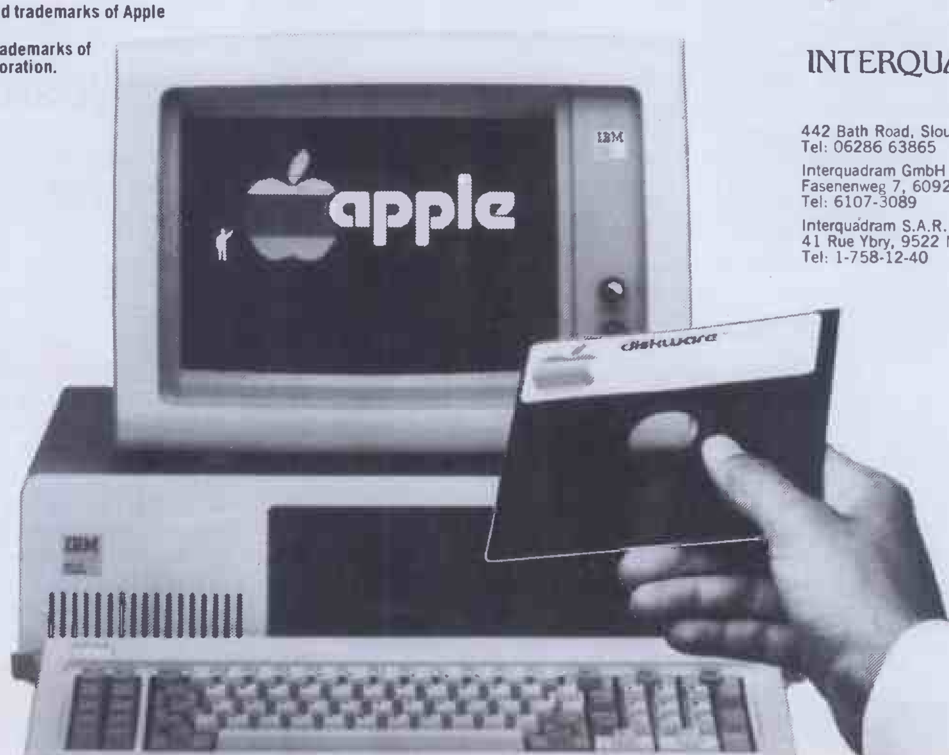
☑ Absolutely true.

Quadlink is available only at authorized full-service Quadram dealers.

☑ True. So visit the Quadram dealer nearest you today a ask to see Quadlink in acti And while you're there ask about our full line of IBM P enhancements. Including the popular six-function Quadboard. You'll agree: when it comes to quality engineering and dependab performance, Quadram passes the test.

Quadlink™ by Quadram™.

Like having an Apple Computer inside your IBM PC.



INTERQUADRAM
LIMITED

442 Bath Road, Slough, Berkshire
Tel: 06286 63865

Interquadram GmbH
Fasenenweg 7, 6092 Kelsterbach, Germany
Tel: 6107-3089

Interquadram S.A.R.L.
41 Rue Ybry, 9522 Neuilly, France
Tel: 1-758-12-40

BENCHTEST

TANDY MC-10

The Tandy MC-10 marks the debut of another competitor in the sub-£100 market. Aimed at the first-time buyer and leaning heavily on support from its big brother, the TRS-80 Colour computer, Surya set out to examine its worth.

At first sight, the Tandy TRS-80 MC-10 looks something like a cross between a Spectrum and an Oric. It is the same sort of size, has a similar system to the Spectrum for keyword entry and, selling at £100 for the 4k model and £40 for the add-on 16k RAM-pack, this would certainly appear to be the market at which Tandy is aiming.

The MC-10 is a downmarket version of the TRS-80 Colour computer, which has a high degree of compatibility with the Dragon 32. It uses a similar processor and the Basic is almost identical except where graphics are concerned. The profile of the MC-10 is very much a beginners' machine with all the frills of its more expensive brother left out in order to bring the price down to a level acceptable to the first-time buyer. It is unlikely that anyone would consider it as a second micro due to its rather limited power. The machine is cheap and basic and makes few pretentions to be anything else.

Hardware

Measuring 22×18×5cm, the MC-10 stands higher than either the Spectrum or Oric but is smaller in width and depth. According to the manual the machine weighs in at '836.32 grammes'.

The casing is a fairly robust-looking white plastic. The legend 'Micro Colour Computer' is emblazoned across the top of the machine and the company logo is in the top right-hand corner.

On the right-hand side is the power on/off switch. At the rear of the machine are (from left to right): the AC adaptor socket, TV socket, reset button, RS232C serial port and cassette port. The reset button is coloured red but the colour signifies no particular danger, because reset performs a 'warm start', leaving memory contents unaffected.

Between the reset button and the TV socket is a metal strip held in place by two screws. Removing this plate reveals the edge-connector for the 16k RAM-pack.

The underside of the machine bears the greeting: 'Opening case will void warranty.' This label covers one of the four screws holding the case together and is impossible to replace without leaving evidence of your action. A small panel tells you which channel the machine is tuned to (36 in the UK) and a speaker grille is beneath it.

And that concludes connections to the outside world. No doubt Tandy or other companies will find other uses for the

Photography by Andrew Johnston

edge-connector at the rear of the machine, but the machine seems to have placed itself firmly in the 'first-time user' class with few easy expansion possibilities.

Keyboard

The keyboard is similar to a calculator in size and feel. The keys are closer together than those of the Spectrum or Oric — a bit too close for someone with fairly large hands — but are more responsive, giving both an audible click and positive tactile feedback.

The MC-10 has two options for keyword entry. The first of these is simply to type the word in full as with most machines. The second option is to hold down the control key to allow dual-key access to about two thirds of the available statements and commands. If you are used to the Spectrum keyboard for keyword entry, this is likely to be more of a hindrance than a help: the positions of the keywords on the MC-10 are totally different.

The distribution of the keywords around the keyboard is based on function, so, IF, THEN and ELSE are grouped together. As I am familiar with the Spectrum, I found the layout unsettling at first but eventually got used to it. On balance, I prefer the Spectrum layout but this is purely a personal preference.

I was generally unimpressed with the keyboard. There is no manual or auto repeat. The keys are too small and too closely spaced. There is a large space bar, but the ENTER key is only marginally larger than the alpha keys and certainly does nothing to suggest to the first-time user that it is particularly significant. There is only a single shift key, placed at a higher level than the space bar and on the right-hand side of the keyboard. To enter brackets, I found myself continually tying my hands in knots. The break key, too, is badly placed right above the ENTER key; it is all too easy to hit accidentally. Also, the CONTROL key is where you'd expect a shift key to be.

On the plus side, the arrow keys (they don't give full cursor-control as you might expect from their appearance) are sensibly placed, using control-W,-Z,-A and -S for up, down, left and right respectively. This and the reasonably positive feel of the keyboard is about all I can honestly find to say in its favour: it's not a keyboard I would like to use all the time.

Inside

Venturing inside the machine (voided warranties hold no fear for *PCW* reviewers!), I found that two flat cables prevent the case being opened more than 90 degrees. To open it right the way out would involve removing the keyboard casing. Having played that game before on a different machine and ended up with keys scattered all over the floor, I settled for 90 degrees.

'The MC-10 is a downmarket version of the TRS-80 Colour computer, which has a high degree of compatibility with the Dragon 32.'

The processor is a Japanese 6803. Other than that, the innards held no surprises. The chips, as one would expect in a machine of this size, are soldered directly onto the board. Everything appears neat and ship-shape — no signs of any last-minute changes — and all the components are clearly labelled. Together with the circuit diagram (not supplied) it would be easy enough to find your way around.

The 6803 is almost identical to the 6809, and was probably selected by Tandy on the basis of price; the 6803 requiring less in the way of support chips.

MC Basic

Normally, Benchtesting a machine with its own version of Basic, I would expect to devote a fair amount of time and space to examining the features of that particular implementation of the language. But in the case of the MC-10, I can find very little to say.

The MC-10 supports a Basic known as MicroColor Basic. A year or two ago, MC Basic would have been acceptable though uninspiring, offering a total of fifty-eight statements and/or commands. Today, such a limited implementation of the language is quite unacceptable even — some would say, especially — for a first-time user's machine.

Tandy is not out to make us into structured programmers. MC Basic supports neither WHILE-WEND nor REPEAT-UNTIL. Nor is any form of defined function or procedure offered.

The only feature worthy of note is CSAVE*. CSAVE* allows you to save the contents of a numeric array directly onto tape under a given filename. The array is then read back in by the CLOAD* statement. Anyone who has painstakingly written routines to perform just this function with several different arrays will appreciate just how useful this feature is.

Other than CSAVE* and CLOAD*, MC Basic conforms to standard Microsoft Basic to the extent of supporting little more. All the standard operators are supported including logical AND, OR and NOT. If you are familiar with just about any dialect of Basic, you'll have no problems finding your way around MC Basic.

Graphics

As with the Basic, the graphics are very limited in comparison with other colour machines. The addition of colour is the only difference between MC graphics and standard TRS-80 graphics.

The graphics are low-resolution, comprising a 64×32 grid. SET (x,y,z) lights up block (x,y) in colour z. RESET (x,y) switches the block to the current background colour, and POINT (x,y) returns the current colour code of the specified block.

The MC-10 supports eight colours (plus black, of course) using the codes 0 to 8 inclusive. CLS z sets the background colour to z; default is green. The MC-10 can display graphics on any of the eight background colours, but alphanumeric characters can only be displayed on the green background.

The character strings 128-143 inclusive provide sixteen low-resolution graphics characters. Adding various values to the ASCII code allows these characters to be printed in any of the available colours.

The character set

The MC-10's character set is standard ASCII but — as with Tandy's other colour machine — the video display supports upper-case only. Lower-case characters can be sent to the printer, these appearing on the screen in inverse.

Editing

I am prepared to put up with a fair number of shortcomings on a machine selling at £100. I don't, for example, expect a full screen editor. But in the absence of such a luxury I do expect a good old-fashioned

The MC-10 has few obvious expansion possibilities.

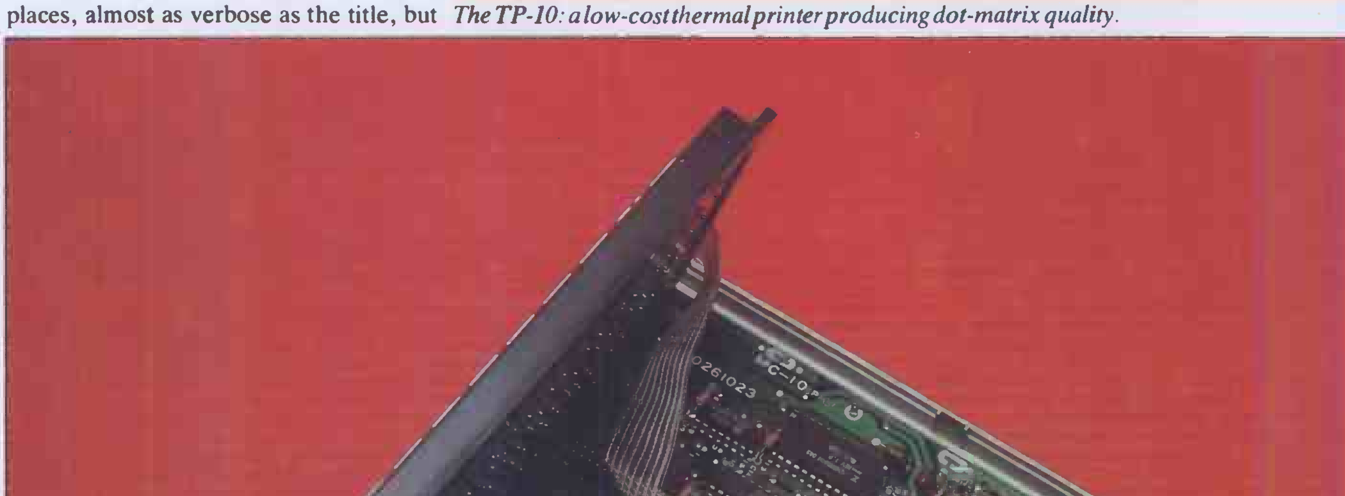
line editor. The MC-10 does not oblige. It offers no form of program editing whatsoever. No screen editor, no line editor, nothing.

I could rant and rave for some considerable time about the unmitigated gall of a company producing a machine which expects the user to type in an entire line all over again simply because the poor thing missed out a comma between the third and fourth characters. But I'll restrain myself. When I asked Tandy about the lack of an editor, I was told that it was for reasons of cost 'and anyway, most kids don't mind typing things in again'.

Documentation

Documentation takes the form of the 'Radio Shack TRS-80 MC-10 Micro Colour Computer Operation and Language Reference Manual'. The manual is, in places, almost as verbose as the title, but

The TP-10: a low-cost thermal printer producing dot-matrix quality.



The processor is a Japanese 6803, sister to the 6809.

given that the machine is aimed at beginners this is probably no bad thing.

Comments on manuals are always highly subjective since we all have our own ideas about how manuals should be written. The MC manual is a pretty average tutorial-style ringbound affair comprising some 140 pages. In common with many home computer manuals, it lacks a cross-referenced index. The contents list at the beginning of the manual, though, is comprehensive and acts as a rather short index.

For those familiar with programming in Basic, Appendix F — the MC Basic summary — and the quick reference card contain most of the information you'll need. For beginners, the tutorial appears adequate, though it is highly patronising in sections. Witness: 'Try typing in the following line exactly as it appears below (be sure OK is displayed):

PRINT "HI, I'M THE MC-10"

'Now check the line. Is it exactly as above? Be sure to check the spelling of the word PRINT and the quotation marks, especially the first quote.'

In general, the manual is adequate and accurate: I discovered only one error in the keyword syntax (missing comma in SET).

Software

Tandy claims that the MC-10 will run any existing TRS-80 Colour Basic software with what it describes as 'minor modifications'. On checking with Tandy, it appears that this statement (made in a press release) should have said that existing Colour Basic *listings* can be *typed* in with 'minor modifications'. Programs for the standard Tandy Colour Computer cannot be loaded from cassette.

Tandy will be launching four cassettes for the MC-10 this month. These are draughts, a screen design program called 'Maths & Draw', Pinball and a pack of four or five games. No review copies of these programs were available at the time this Benchtest was carried out.

Peripherals

As I have already mentioned, the MC-10 is not designed with expansion in mind. Tandy has no immediate plans to produce any add-ons beyond the 16k RAM pack and a printer known as the TP-10.

The MC-10 has an RS232C port in the form of a four-pin din socket. This enables it to be hooked up to any Tandy printer with a serial interface. (It can also be hooked up to other printers provided that they can be set to perform a line feed on receipt of a carriage return. This is necessary since the MC-10, as with other Tandy machines, does not send a line feed character with a carriage return when printing. Tandy printers automatically line feed with each carriage return.) Tandy, has also produced its own printer specifically for the MC-10: the TP-10.

The TP-10 is a thermal printer (that's why it's called TP) which is due to be launched during November. It will sell at just under £80.

The maximum column width of 32 (across four inches) precludes serious wordprocessing applications even if the MC-10's keyboard hadn't already done so, but the printer is perfectly adequate for invoices, program listings and so on.

Printing speed is reasonable at 600 baud and, being a thermal printer, the TP-10 is almost completely silent in operation. Surprisingly, the quality is comparable with dot-matrix output. As well as upper and lower case, the TP-10 will also print the block graphics characters produced by the MC-10.

Benchmarks

BM1	1·5
BM2	9·1
BM3	17·3
BM4	18·9
BM5	20·3
BM6	29·9
BM7	44·3
BM8	112·0

All timings in seconds. For an explanation of the Benchmark programs, see PCW *Vol5 No 11, November 1982.*

Prices

4k TRS-80 MC-10 MicroColour Computer	£99.95
16k add-on RAM pack (bringing total RAM to 20k)	£39.95
TP-10 Thermal Printer	£79.95

Technical specifications

Processor	6803
Standard RAM	4k
Maximum RAM	20k
Interfaces — printer	RS232C (4-pin din)
— cassette	5-pin din
Power requirements	Mains adaptor supplied: 1.5A at 8VAC

The TP-10 can also be used with other machines with a serial printer port.

Conclusions

I have little doubt that the MC-10 will sell. To the person with little experience of computers, Tandy computer stores are a natural place to go simply because they are so accessible. This is important both from the point of software availability and servicing and repair. Any machine which sells well generates a proliferation of software and — given the similarity between Colour Basic and MC Basic — no doubt software houses will hurriedly convert all their existing Tandy Colour Basic software.

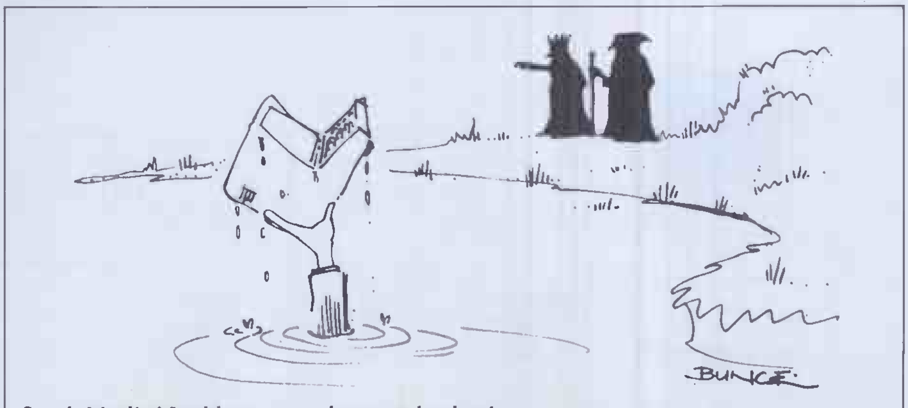
In a market with more than its fair share of cowboys and fly-by-night companies, the fact of a long-established company with a large chain of High Street stores is reassuring, particularly to those new to the game of computing.

Aside from the matter of the non-existent editor, the MC-10 does serve as an adequate machine on which to learn about micros. A beginner is not going to miss facilities s/he has never heard of. The question I found myself asking was 'just because a machine is aimed at beginners, is this any reason to provide a less powerful language?'

When choosing a computer in this class, much of the process is subjective of course. Some of the comments I made about the keyboard might be quite irrelevant to some users — particularly younger children whose fingers will be a lot smaller than mine.

Given this, the price-tag of £100 places the MC-10 in direct competition with the Spectrum and Oric whether or not Tandy sees this as its market. Whether you look at the amount of RAM offered as standard, the power of the Basic, the graphics or the expansion possibilities, the MC-10 does not stand up at all well to this comparison. Both Oric and Spectrum offer 16k to the Tandy's 4k. Sinclair Basic and Oric Basic, especially in the area of graphics, are considerably more powerful than that of the MC-10. The field of expansion is less easy to define, since most of the add-ons come from independent firms rather than the company that produced the machine, but if Tandy has any expansion plans it is keeping them to itself.

The MC-10 was launched at the PCW Show and is now available in Tandy shops. END



Look Merlin! I told you swords were obsolete!

BULLETIN BOARDS
GET ON THE PHONE TO YOUR MICRO

Peter Tootill gives the uninitiated an insight into the esoteric world of bulletin boards.

Most micro hobbyists will have been asked: 'But what do you do with it?' when a friend finds out that they have a micro at home. When I tell them what I do with mine, the usual follow up is 'What on earth is a Computer Bulletin Board?'.

So, what is a computer 'Bulletin Board System' (BBS for short)? Well, the idea started in the USA, when a computer club decided that pinning notices and messages to other members on a cork board on the wall was a bit far behind the times for a high technology outfit like theirs. They decided to hook a computer to a telephone and allow people with micros, or even ordinary terminals, to dial in and post messages on this system. The idea caught on, and was taken up by other clubs and by individuals with the result that today there are at least a thousand, maybe many more public BBSs operating in North America. Sophisticated BBS software is now available for most of the popular micros; the facilities provided have developed considerably, and recent systems will allow callers to do a wide range of things. However, the main emphasis is still on the traditional message and mailbox facilities. Most BBSs will tell you if you have a message waiting when you call and let you search for messages on a particular subject. Messages can be private or public, general interest or collected into special categories. Other usual features you sometimes find are information and news files, help for inexperienced users, software to 'download' games and diversions, commercial sections, and even advertising.

'How do I use such a system?' you might ask yourself. The essentials are an ordinary telephone, a modem, and a terminal of some sort, which for most people will be a microcomputer with an RS232 (or V24) interface and some sort of terminal software. Let's take the list in reverse order (except for the telephone, which you will have to see Buzby about!).

Dumb and smart terminals

Software which makes your microcomputer act like a computer terminal is readily available in the 'public domain' (ie, free of charge) for most micros. User groups will normally be able to help out with this. Commercial software is also available which usually, but not always, provides more facilities than the free stuff.

The software is divided into two main categories, often referred to as 'dumb' and 'smart' terminal programs. The 'dumb' type is quite adequate for your first steps into the world of computer communications and for using most of the facilities of a BBS. A dumb terminal package is often provided with an RS232 interface if your micro doesn't include one.

The main advantage of a 'smart' terminal program is the ability to save incoming data to disk or tape. This is essential for 'downloading' or receiving software over the telephone line from the BBS, and useful for saving messages and other information for later perusal with the phone firmly back on the hook!

A dumb terminal program is very simple to write for yourself; all that is required is a routine to take what you type at the keyboard and transfer it to the RS232 port, and another to display incoming data from the RS232 on the screen. This can be done in Basic on most systems, provided that the interpreter is fast enough to keep up with the 30 characters a second that will be coming down the line at 300 bits/sec, the speed at which most of these systems operate.

Standard RS232 settings:
7 bit word (exc parity bit)
Even parity
1 stop bit
Alternative settings* that should work with most BBS:
8 bit word
No parity
1 stop bit
* Most terminal software just ignores parity anyway, so this setting will normally work satisfactorily, and give the added possibility of transferring binary data using standard CP/M protocols (which aren't just for CP/M systems). More about this in 'Network News' in the near future.
Fig 2

Serial interface

The RS232 interface (or V24, or RS423; they are basically the same) is simply a device to convert the *parallel* data that the computer uses into *serial* data. That is from 8 bits in parallel, one on each of 8 wires, to 8 bits one after the other on one wire (two if you include the 'ground' or earth wire). This is essential if the data is going to travel on the telephone system which has two wires. (The other wires you may find between the modem and the RS232 interface are for control signals, and not data).

Modems

The final stage is for the *modem* to take the serial *digital* data and convert it into serial *analogue* data; that is, to translate it into a form with which the telephone system, being designed to handle the electrical equivalent of sounds, can cope (see Fig 1). The digital, or on/off signals are converted into signals of two different frequencies

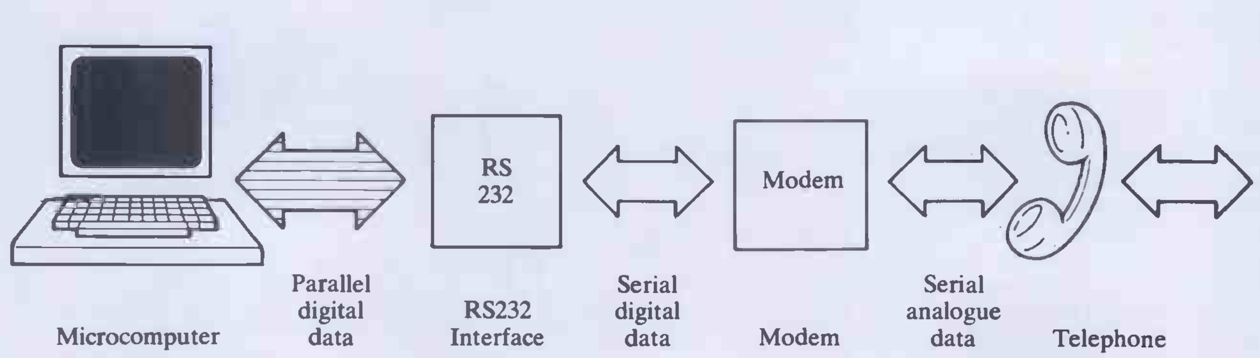


Fig 1

representing the 0's and 1's of the computer's digital data.

Modems come in two basic forms, acoustically coupled, in which you put the telephone handset in a pair of rubber cups on the modem, and 'hard wired' or 'direct connect', which connect directly to the telephone wires, usually by means of a plug and socket. The latter are normally more reliable as they don't suffer from the inherent loss of efficiency arising from converting the signals into sound waves and back again. Acoustic types can also suffer from the effects of background room noise, (a cushion or a blanket can help with that problem).

Another variation in modems is that some are 'originate' only and some are 'originate/answer' types. To establish communications between two modems at opposite ends of a telephone line, one must be in originate mode, the other in answer mode. Normally the person who dials the number will set his modem to originate and the one receiving the call will be in answer mode. This is often handled automatically by direct connect modems, especially with a bulletin board, which will normally use what is called an 'auto-answer' modem which actually answers the phone by itself. Note that two 'originate only' modems cannot talk to each other.

The reason for the two modes is that, in this sort of application, data will be travelling in both directions on the wires at the same time (called 'full duplex'). This is so that the receiving system can ECHO back what it receives to the sender, who can see if it has got corrupted on the way. The two streams of data are kept separate by using two different frequencies, with the originator using one and the receiver the second. In some situations the echoing is done by the modem at your end, or even by your terminal software, this is called half duplex mode.

Using a BBS

The procedure for using a BBS is first of all to set your RS232 to one of the standards shown in Fig 2. Your RS232 manual should help you if you have problems. Now load the software (this sometimes has the facilities to set the RS232 built in to it), switch on the modem, and dial the number of the chosen system (see 'Network News' for a list of some available numbers), taking care to note whether the BBS operates normally, or expects you to ring twice (the so called 'ring back' method).

If you get a human answering the phone, don't drop it in surprise. The BBS may be off the air for some reason, and the operator (usually called the 'sysop') will be able to tell you what's happening and when to try again. There is also the chance that the number you have is wrong or out of date, so hang on to the phone and ask! If you are successful, you should hear a whistling noise from the other end.

When you do, switch your modem 'online', or put the telephone handset in the coupler. The carrier detect light, if the modem has one, should come on more or less immediately. If it doesn't, make sure that your modem is set to 'originate' mode. If it is an originate/answer type it will have a switch to select the mode somewhere on it and if such a switch is not visible you can assume it is originate only. If you still have problems, try dialling again, or try a different number; sometimes you will get a very bad line and it will not provide a strong enough signal for the modem to latch on to, especially if it is an acoustic type. Remember, too, that you cannot call a 300 bit/sec service with a Prestel or Micronet modem, or vice versa. Furthermore, American systems use different frequencies at 300 bits/sec to those used in Europe, so if you are buying a modem of American origin, make sure that it is set to CCITT V21 tones, and not Bell standards or you will not be able to use it for the majority of European systems.

If all is well at this stage, you should see something appearing on your screen. If not, hit 'enter' or 'return' a couple of times. If you get something, but it makes no sense, the usual reason is either that you've got a very bad line, which (all credit to British Telecom) is not very common, or your RS232 settings are not compatible with the system you are calling (see Fig 2.) What you should see is some sort of welcoming message, normally followed by a request to enter your name (Fig 4). After doing this you will probably be asked a few technical questions about your computer's screen width, line fees and nulls. The first is obvious. The nulls question just refers to the amount of time the system will pause after sending a carriage return before starting a new line. This is most important for printer type terminals as the head has to have time to return to the start of the line. If you're not sure start with 5 for a video display and somewhere around 20 for a printer type. You can always alter these later if they are not quite suitable.

The other question you will be asked is whether you need line feeds to be sent with carriage returns. If you're not sure answer 'yes'; again, you will be able to change it if the lines on your screen are double spaced. Most systems will only ask you these questions on your first call, remembering you after that, but there will be a means of changing these parameters in the system somewhere, should you wish to do so. However, you may get 'forgotten' if you don't call the system for some time, and as a result will have to answer the questions all over again.

Eventually, you will come to the main menu — see Fig 3 — perhaps after an introductory news bulletin, and this is the heart of the system. You are now on your own and 'flying solo'. The way to get to know the system is simply to explore the various menu commands. Most will lead to sub-menus, and things may seem a bit complex at first, but you will soon get the hang of it.

One thing I would encourage you to do is to contribute to the BBS when you call. Don't just look around and go away again, leave a message, or better still, messages. Everyone has something they can pass on whether it be a tip about their own micro, a question, or just plain gossip! Messages are what make the system interesting for other callers (on my own BBS a poll showed that this was the feature that 70% of callers liked best). As I keep telling people, more messages mean more interest, and more interest means more callers, and more callers means more messages . . .

Happy communicating! END

```
<R>ead Messages on main board
<S>can Messages on Main Board
<E>nter Messages on Main Board
<K>ill messages on main board.
<M>ail ... Electronic mail section.
<G>roups ... Special Interest
          Groups
<H>ow-Long ... Elapsed Time on
          System
<T>erminate Session
<I>nfo ... System Information
<N>ews Bulletins
<D>ownload Programs
<£>Upload ... Submit programs
<U>serlog ... List of callers
<C>hat ... Talk to SYSOP
<A>gain ... Re-logon to system
<P>roducts ... List of Merchandise
<O>rder ... Place Merchandise Order
<L>ocal features and utilities
```

Fig 3 Main Command Menu

```
Welcome to TBBS European Headquarters

* * *  LIVERPOOL  MAILBOX  * * *

Britain's first 24 hour microcomputer bulletin board!

Member of the Association of
    Free Public Access Systems.

Liverpool mailbox needs sponsors
See news section for details


First Name? joe
Last Name?
```

Fig 4 Typical welcome frame from bulletin board

MICRO CHESS

ADVANCE WARNING

Tony Harrington talks to Dave Wilson and Mike Johnson, last year's winners of the PCW *Chess Tournament, about their successful chess program, Advance 2.4*

The mysteries of print schedules are to blame for the fact that although you are reading this long after the last move has been played in the 4th European Microcomputer Chess Championship, I am writing it some weeks before the start of the event.

Next month, you will have a full, blow by blow account of the Tournament. But since, from my point of view, we are still on the before side of the Tournament, it seems fitting to give a profile of the authors of the program which won last year. Who knows, perhaps they will have won this year's too!

Last year's winners were Dave Wilson and Mike Johnson, with their joint entry, Advance 2.4. They swept all before them, conceding only two draws in the seven rounds.

The two joined forces for the first time in early 1980 to produce a program for that year's *PCW* Tournament. Wilson was then, and still is, a member of British Telecom's R & D team, while ever since the 1981 *PCW* Show, Mike Johnson has worked for Intelligent Software (profile in *PCW*, April 1983).

Ask either of them what interests them about computer chess and the answer you get is, in a word, 'winning'. 'There is nothing like watching your program grind through all the opposition. It's a very satisfying sight,' Wilson told me.

For both of them, the idea of writing chess programs seems to have been simply a logical extension of their interest in programming. Johnson in particular tends to look astonished if you ask him how he got into chess programming. 'Because it's there,' he says, in a manner reminiscent of Sir Edmund Hilary's classic reply to the person who wanted to know why he climbed Everest.

They built their own hardware to run it on and ever since its first competition, their program, Advance 2.4, has proved a formidable opponent.

Their rivals will be the first to point out that the special 64 databus hardware that fuels Advance 2.4 gives it something of a headstart over most other programs. It runs on a bit-slice machine and is a great deal faster than standard microprocessors. This fact has caused a few organisational headaches at *PCW* Tournaments in the past, where there were hot disputes as to whether or not the machine qualified as a microcomputer.

Fortunately, it has now become an accepted presence at the Tournament each year and the grumbles about unfair hardware have receded. The way the program is written demands a 64 bit wide data structure and so it has to have a 64 bit processor.

According to Wilson, the current version of Advance 2.4 is twice as fast as last year's, so it looks at this point as if the competition is in for a hard time. 'There were a few hardware flaws last year which we didn't have time to sort out before the Tournament began, and they slowed everything down quite a lot,' he said.

But there is some relief in sight for all the other entrants. Wilson and Johnson reckon that Advance has reached its peak this year. 'There is nothing much more that we can do to the algorithms or the scoring function to improve it. In fact, aside from rectifying the hardware faults, we have hardly touched the program since last year,' Wilson commented.

'To improve it now we would either have to invest in some amazingly expensive hardware or redesign the software totally.'

Instead, he and Johnson have each been working hard designing their own programs. And there is not too much that they can collaborate on with the new programs since they have taken theoretically opposed paths.

Both are somewhat disappointed with the state of the art in chess programming at the moment. They feel that no-one has really made any great theoretical leap forward in getting computers to play chess more 'intuitively' instead of relying on raw number crunching. In practice, they point out, since the programming problems are not being solved completely, the faster you can make your processor go, the more positions you can look at, and the more chance you have of producing a winning machine.

'We're highly sceptical of the ratings that some of the commercial suppliers are claiming for their machines. When you hear of 1900 and 2000 ratings for dedicated computer chess machines, it's a laugh. We know from experience that no matter how well Advance does against other chess computers, when we put it into a human tournament like the North London Congress, it gets slaughtered by all and sundry,' they pointed out.

The normal preparation for Advance 2.4's entry into the *PCW* Show is an outing at one or two local chess tournaments. 'The traditional result is a point or two for us, usually as the result of a bye!' Johnson remarked. 'When we wheel it out at these events, we usually find ourselves having to solve one hardware problem after another. And when it does play through a whole game, the player, no matter what his or her grade, tends to walk all over the machine.'

This comment, though it is borne out by the results (as you can see from the table of events in which Advance has competed) is a little unfair on the state of computer chess. Several of the machines now available (or due to become available by Christmas this year) look well able to give the medium club player a very tough struggle.

The results of this year's Tournament, coupled with the World Championships held in Budapest shortly after the *PCW* championships end, will answer quite a few questions about the current state of computer chess.

Games section

White: Ostrich. Black: Advance 2.4. Dallas 1982, Sicilian Defence. Notes by David Levy.

Ostrich is one of the more experienced programs on the chess circuit, having competed in the North American and World Championships for many years. Its author, Monroe Newborn, is one of the world's leading authorities on computer chess, and has written a book, *Computer Chess* published by Academic Press. In the Dallas Tournament, Ostrich was running on 8 Data General Nova computers — working in parallel.

1	e2-e4	c7-c5
2	Ng1-f3	d7-d6
3	d2-d4	c5xd4
4	Nf3xd4	Ng8-f6
5	Nb1-c3	a7-a6
6	Bc1-g5	e7-e6

(This position has been seen literally thousands of times in master games, with White playing 7 f2-f4 in more than 99% of

ADVANCE Microcomputer Chess System — Results Against Computers

Competition, Place, Date	Ver	Position	Points	W	D	L	Rating	Comments
1st World Microcomputer Chess Championship, London, Sep 1980	—	3:14	3:5	2	2	1	—	Best Amateur
3rd World Computer Chess Championship, Linz, Oct 1980	1.0	12=:18	1.5:4	1	1	2	—	
2nd European Microcomputer Chess Championship, London, Sep 1981	2.0	2:12	4:5	4	0	1	—	
Against BCP, London, Jun 1982	2.3	—	2:2	2	0	0	—	BCP was 6= in Linz
3rd European Microcomputer Chess Championship, London, Sep 1982	2.4	1:12	6:7	6	2	0	—	European Champion
Against FIDELITY 9, London, Sep 1982	2.4	—	2:2	2	0	0	—	
Against CONCHESS, London, Sep 1982	2.4	—	2:2	2	0	0	—	
Against MEPHISTO 2, London, Sep 1982	2.4	—	2:3	2	0	1	—	
13th U.S. ACM Computer Chess Championship, Dallas, Oct 1982	2.4	5=:14	2.5:4	2	1	1	1649	
AGGREGATE SCORE since Sep 1980			25.0:34	22	6	6		73.5%

ADVANCE Microcomputer Chess System — Results Against Humans

Competition, Place, Date	Ver	Position	Points	W	D	L	Rating	Comments
1st North London Autumn Chess Congress, London, Oct 1981	2.1	—	0.5:6	0	0	0	—	0.5 bye, 6 h/w failures
17th Islington Chess Congress, London, Dec 1981	2.1	—	1:6	0	1	0	—	0.5 bye, 5 h/w failures
Grieveson Grant British Championship Qualifying Tournament, London, Jun 1982	2.3	40=:81	2:5	1	2	2	1776	2 h/w problems
11th London Chess Congress, London, Jul 1982	2.3	—	1:6	0	1	4	—	0.5 bye

The ADVANCE Microcomputer Chess System vs computers and humans.

those encounters.)

7 Bf1-e2?

(White's first move out of the openings book is an insipid choice.)

7 . . . Bf8-e7

8 Bg5-e3

(A retrograde step. Ostrich may have been worried that after a safe-looking move such as 8 0-0, Black can play 8 . . . Nf6xe4 9 Bg5xe7 Ne4xc3 10 Be7xd8 Nc3xd1, when Black has won a pawn.)

8 . . . Nb8-d7

9 0-0 Nd7-c5

(Black is playing well, and exhibits a good understanding of the ideas behind the Sicilian Defence. The text puts pressure on the e4 pawn and invites White to weaken itself along the g1-a7 diagonal.)

10 f2-f3 Qd8-c7

11 a2-a4

(Preventing the thematic Q-side thrust . . . b7-b5.)

11 . . . 0-0

12 Qd1-e1 e6-e5

13 Nd4-b3

(A tempting possibility was 13 Nd4-f5 Bc8xf5 14 e4xf5, followed by g2-g4, g4-g5 and Qel-h4, with attacking prospects on the K-side.)

13 . . . Nc5xb3

14 c2xb3 Bc8-e6

15 b3-b4 d6-d5!

(A fine positional move. Whenever Black can get away with . . . d6-d5 in the Sicilian Defence, it is a sure sign that White's prospects are going downhill.)

16 e4xd5 Nf6xd5

17 Nc3xd5 Be6xd5

18 v4-b5?!

(It is difficult to justify this move. Ostrich may have expected that it would lead to the undoubling of the b-pawns, but this is not the case. I would probably have played 18 Ral-c1 Qc7-d7 19 Be3-c5 Be7xc5 20 Rc1xc5, when White's initiative appears to compensate for the doubled pawns.)

18 . . . Be7-c5

19 Be3xc5 Qc7xc5+

20 Kg1-h1 a6-a5

(No undoubling of the b-pawns.)

21 Qe1-g3 Qc5-d4

22 Ral-d1 Qd4xb2

23 Qg3-f2

(Passive. White might have tried 23 Rd1xd5 Qb2xe2 24 Rf1-e1 Qe2-c4 25 Qg3xe5 Qc4xa4 26 Rd5-d7, when although a pawn down, the rook on the 7th rank and domination of the e-file might provide adequate compensation.)

23 . . . Ra8-d8

24 Rd1-d3 Bd5-b3

25 Qf2-g1 Rd8xd3

26 Be2xd3 Bb3xa4

(In winning a second pawn, Black has allowed its bishop to go offside. White might have been able to take advantage of this with accurate play, but somehow Ostrich seems to lack the necessary energy at this point in the struggle.)

27 Qg1-c5 Rf8-d8

28 Bd3-c4?

(Now 29 Qc5-c7 might have saved the game.)

28 . . . Qb2-b4!

(Virtually forcing the exchange of queens, and getting a dangerous passed pawn to boot.)

29 Qc5xb4 a5xb4

30 h2-h3 Ba4-c2

31 g2-g3 b4-b3

32 Kh1-g2 Rd8-d4

33 Rf1-al Kg8-f8

34 Ral-a8+ Kf8-e7

35 Bc4xb3

(The pawn could not be stopped.)

35 . . . Bc2xb3

36 Ra8-h8 h7-h6

37 Rh8-c8 Rd4-d2+

38 Kg2-f1 Bb3-d5

39 f3-f4 Rd2-d3

40 f4xe5 Rd3xg3

41 h3-h4 Rg3-g4

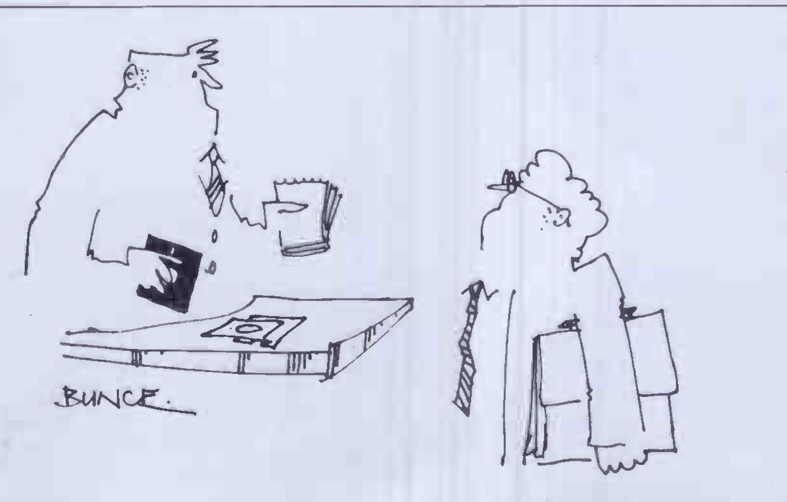
42 Rc8-g8 Bd5-c4+

43 Kf1-e1 Bc4xb5

44 Rg8-b8 Bb5-c6

45 Rb8-g8

(and White resigns.) END



'Listen, kid, this Flight Simulator program is so real it comes with a set of brown paper bags.'

BENCHTEST

AQUARIUS

Mattel Electronics has made the logical progression from leading toy manufacturer to computer manufacturer with its home computer, the Aquarius. The marketing pitch surrounding the machine emphasises comprehensiveness and good family entertainment. With the Christmas season approaching, this could be just the recipe for success. Tony Hetherington presents his findings.

Bearing in mind that Mattel is a leading toy manufacturer, it is somewhat surprising that the company has left its entry into the home computing market until now. What is less surprising is the quality and attention to detail that is inherent in the Aquarius home computer.

There is no doubt of the market at which the Aquarius is aimed, for everything about it says to the prospective buyer, this is simple, easy to understand and fun. Image at this end of the market is vital and Mattel has made use of all available techniques to promote an image of homely fun. Both of the manuals have strategically placed potted plants on their covers and the packaging is reminiscent of toy packaging.

Mattel has been observing from the TV games sidelines for some time but is now ready to attack the home computing market.

Hardware

The Aquarius home computer is coloured cream and black and is rather angular in shape. The basic machine comes with two manuals, power supply, an aerial lead and an aerial junction box which will prevent the usual scrambling behind the television for the right aerial lead. The power supply isn't particularly pretty and should probably be kept out of sight. It is permanently connected to the Aquarius so there will be no sudden power plug losses.

On the right-hand edge of the Aquarius is an on/off switch with an accompanying green light to show when it's switched on. Unfortunately due to a large capacitor inside, the light comes on even when the Aquarius isn't even plugged in.

The keyboard itself consists of 49 rubber keys which are mounted on a membrane keyboard giving them the feel of Spectrum's keys with the size and the action of those of the ZX81. They are coloured a rather garish blue with white legends, which is definitely not my personal taste, although they may appeal to young children. The reset key has the same colours in reverse. Since pressing it has the same effect as turning the machine off it is enclosed by a ridge to prevent its accidental depression.

Also supplied in the beginners' package is a Basic keywords overlay which when on the machine buckles slightly and refuses to lie flat.

I feel that this overlay is unnecessary since the keywords it has printed on it could easily have been printed on the keyboard.

Only six screws offer any defence against inquisitive fingers getting inside the machine. The components are well laid out. The processor is a Z-80; no surprises there.

The Aquarius has 4k of RAM although this can be increased to 8k or 20k by the addition of a RAM-pack cartridge.

Looking under the cover isn't actually encouraged but there are no curt warnings that undoing a screw will invalidate a guarantee. This I found encouraging since it may help reverse an increasing trend, that the insides of micros are sacred. I feel that a brief, respectful look under the cover can only help the learning process and dispel any fears a child may have.

Above and to the right of the keyboard is the cartridge slot. It is here that program cartridges, RAM packs and the mini expander can be plugged in.

Mini expander

The main marketing pitch of the Aquarius is that computing is fun. The second is that the Aquarius is a growing machine. Plugging the mini expander into the cartridge slot enlarges the Aquarius in three ways. One: two expansion slots; two: two games paddles; and three: two more

The Mattel Aquarius: the first colour computer selling at less than £50

Photography by Ian Dobbie

A fully expanded system comprising expander, data recorder, games paddles and printer comes in at £310!

sound channels, giving three in total.

Inside the plastic case is a motherboard with two 42 pin edge connectors: one specifically for program cartridges, the other for RAM packs. The cartridges and the mini expander itself are encased in metal boxes, which being soldered are almost impossible to take apart. These metal cases are designed to keep the contents free from radio interference but this means that should a fault occur it would be easier to replace the whole box than repair it.

The edge connectors themselves are covered by small black trap doors whose function I couldn't determine. Each connector has two of these dinky doors that are held shut by fragile looking springs. If they are there as dust covers then they will keep the circuitry dust free while they are shut, but if a cartridge is inserted the connectors will be showered in dust as the doors are pushed open. On the other hand if they are some sort of anti-child protection for the circuits below, then again they fail because they will be a magnet to young fingers. A further problem with the doors is that they mask the connectors from easy view making it difficult to see where a cartridge should be inserted.

'The main marketing pitch of the Aquarius is that computing is fun. The second is that the Aquarius is a growing machine.'

All the cartridge slots are a very tight fit and a hefty pull is required to remove the cartridges. Although this ensures a firm connection it makes it difficult for a child to remove the cartridges. This seems to me a nasty case of 'Sinclair-RAM-pack-wobble paranoia' caused by loose connections on the Sinclair RAM pack. It is a little daft since it is at children that the Aquarius is aimed.

Two equally firm connectors plug into the back of the mini expander to add two games controls, making the Aquarius look like a junior version of Mattel's Intellivision. The two games controls consist of six 'action' buttons and a disk that can be pressed to give movement in any of 16 directions. Be warned, though, prolonged use of these may result in an uncomfortable case of Aquarius thumb.

When in place the mini expander forms an L-shape with the Aquarius creating an obvious space to be filled by the printer.

Printer

The printer has the same cream and black colouring as the other units but with more rounded corners. It is also higher than the others so the controls on the front of the printer are easily accessible if the printer is placed in the L-shaped space. Unfortunately the leads at the back of the Aquarius prevent this so the printer crouches

80cps thermal printer

Data recorder: a dubious luxury


A Z-80 CPU with 4k RAM as standard

uncomfortably behind the keyboard.

The printer has its own power supply and is connected to the Aquarius by a lead which would look more at home on a cassette recorder. There are three controls, two blue buttons on the front and a black mode switch at the rear. One of the blue buttons is an on/off switch with an associated LED which lights up when the printer is switched on and plugged in. The other is an incredibly quiet paper feed control; indeed this is an incredibly quiet printer which is surprising since it is, like the ZX Printer, a thermal device. Being thermal, it requires special paper which increases running costs.

The mode switch at the back of the printer is a graphics select switch and has three settings: graphics, text and mixed. Since the mixed mode supports both the printing of text and graphics the other two modes are superfluous and plans are being prepared to remove them.

The printer deposits purple characters on the white thermal paper at a speed of 80 characters per second, and to a width of 40 to a line of print. The quality of the print is adequate for program listings but is unlikely to be acceptable for any word-processing applications.

Two rolls of paper are supplied with the printer and are rather fiddly to load into it.

Data recorder

The data recorder is the rather elaborate name given to the Aquarius's own cassette recorder which differs from a normal recorder in that it has no volume or tone controls and has a green LED for power and a red one which lights up when it is passing or receiving data. The data recorder is in the same angular style and colouring as the Aquarius and comes complete with cassette leads and a user guide. The inclusion of the cassette leads with the recorder rather than with the Aquarius itself is somewhat unfriendly since Mattel claims that any recorder can be used.

'The Aquarius has a choice of 16 colours all of which can be on the screen at the same time, either as foreground or background colours.'

I tried my own cassette recorder with little success. It recorded data well but then the Aquarius could make nothing of any program loaded in from my recorder, be it recorded on my machine or the manufacturer's own. This was probably due to incorrect settings of tone or volume which the Aquarius data recorder avoids.

The data recorder needs its own power supply, making a running total of three, all of which require plugs and sockets to plug them in. This will probably mean the additional cost of a four-way adaptor with

'Joypad' games controllers

Games cartridge

the fourth socket being used for the television.

In operation, the data recorder was disappointing since unlike other machine-specific recorders it had no computer control. At least a pause button is provided to make things easier. In fact the only difference between the data recorder and a normal audio recorder is the automatic setting of volume and tone. With trial and error anyone can master volume and tone control so the data recorder is a dubious luxury.

Basic

When first switched on, the Aquarius displays the message 'Basic press return to start' in black letters on a changing coloured background. This gives the impression of a busy, interesting machine as opposed to the usual dead screen. Once the return key has been pressed the background is set to blue and the copyright notice for Microsoft Basic is displayed.

Most of the problems I encountered with this implementation of Microsoft Basic involved the use of the data recorder. Confusing messages were displayed. The worst of these was the PRESS PLAY/ PRESS RETURN message which appears both when loading and saving a program. When saving it is telling the user to press the Play and Record buttons on the recorder then to press Return on the Aquarius, but the same message when loading means the opposite — press Return on the Aquarius then start the recorder. Another confusing message comes when a program has failed to load properly and the Aquarius prints the message 'Bad', but it follows this with its standard prompt which is unfortunately 'OK'. This, of course, doesn't mean OK at all and is merely indicating that the Aquarius is waiting for some input. Perhaps 'Ready' would have been a better choice for a prompt.

These examples may seem petty and once the user has familiarised himself with the machine any confusion will disappear, but since the Aquarius is meant to be a first computer such clouding of the learning process should have been avoided.

Some attempt has been made to provide single-entry keywords on the Aquarius. This is the system pioneered by Sinclair where a whole keyword is obtained by pressing a single key. Unfortunately, on the Aquarius, two keys must be pressed, the control key and one other. So making two-letter keywords available by this means is pointless. Mattel's selection of keywords available by this method is a little curious, particularly as not all keywords are represented on the template; yet not all of the keys are used, nor are all of the keywords represented. All this makes the selection of keywords ON and IF and the omission of PRINT and SOUND rather curious.

The choice of reserved words on the Aquarius is particularly restricted due to keywords and function names. Keywords and function names may not be used or included in any variable name. So, for instance, the variable name BONUS is illegal because it includes the keyword ON. An additional restriction is that the Aquarius only takes notice of the first two letters of any variable, thus to the Aquarius Man and Machine are the same.

Graphics

The graphics on the Aquarius are good if a little unorthodox. The character set consists of 255 characters of which over half are graphics. As well as providing an impressive range of block patterns, the graphics characters include spaceships, aeroplanes, and figures facing in all directions. This is just as well since there is no provision for user definable graphics.

The Aquarius has a choice of 16 colours all of which can be on the screen at the same time, either as foreground or background colours. Getting the colours on to the screen is a little laborious but a method is used which more truly reflects how a computer works than the usual ink and paper system.

Before you can alter the black on blue display you need to have grasped the concept of two matrices that are held in memory. The first is the Colour RAM Matrix, and the other is the Character RAM Matrix. Each Matrix has 40 rows and 24 columns and directly corresponds to the screen display. The way to change a colour of a box on the screen is to POKE the code number of the required colour into the appropriate location of the matrix. Similarly, to display an aeroplane at position 12,10 on the screen, the code for the aeroplane (154) is POKEd into location 12,10 of the Character RAM Matrix.

Setting the colour of a screen position is complicated by the ability to set both foreground and background colours. The Aquarius accomplishes this by the use of some mathematics, where the number POKEd into the Colour RAM Matrix is the code of the foreground colour + 16 x the code of the background colour.

Having decided the number to be POKEd into the matrix, the address into which it is POKEd must also be calculated. This leads us into the subject of memory addresses. A computer's memory is divided up into locations or boxes in which a piece of data can be stored. These boxes are numbered with the numbers being called addresses. Some of these addresses, 960 to be precise, are set aside for the Colour RAM Matrix. Another 960 are allocated to the Character Matrix. The number 960 may seem a little curious but it is equal to the number of screen locations.

To find the memory address of a specific screen position the following formula is used: CS + (40*R) + C where R is the row number and C is the column number. The other variable, CS, is the address in memory which corresponds to the start of the Colour Matrix. A similar formula is used for the Character Matrix, though a different start address is used since it occupies a different block of memory.

These two matrices are aptly called RAM matrices since they use up part of the 4k RAM available to the user. Together with other system variables they reduce the usable RAM to just over 1.5k.

Each of the 960 screen locations can be further divided into 3 x 2 squares giving a resolution of 80 columns and 72 rows, or 5760 squares. Each of these squares can be filled by the Command PSET or cleared using PRESET. The colour of each square is determined by the colour of the screen location of which it is a part.

To summarise: the graphics of the Aquarius are somewhat fiddly since each character and colour must be individually set. Some mathematics is involved but it can all be done with standard formulae and should be fairly straightforward for users.

Sound

The sound command is thankfully easier than the graphics and involves the setting of two parameters: the duration or length of the sound and the tone or pitch. Changing the values of these parameters creates an impressive range of arcade type noises which are enhanced by the addition of the mini expander.

Mattel recommends trial and error to discover the noises available and a warning is included that some sounds, although inaudible to humans, may be heard by dogs!

Structure

The IF-THEN, FOR-NEXT and GOTO or GOSUB ON structures are the only ones available. This, coupled with the restrictions on variable names, makes structured programs difficult to write.

Fortunately, the extended Basic cartridge adds a new structure with the MENU command and an impressive range of graphics facilities.

MENU is a single statement command which defines a user menu when the following parameters are set. X and Y are the coordinates of the top left-hand corner of the menu. The spacing between the options is the next parameter which is followed by text to be displayed for each option and a list of the line numbers to which the program will go depending on the option chosen.

LINE is the first of the additional graphics facilities. In its simplest form LINE will draw a straight line between two points with the start of the line being either a specified point or the last point drawn. The inclusion of the parameter 'b' results in a box being drawn with the LINE coordinates being the top left and bottom right corners. The parameter 'bf' draws a box and then fills it in.

CIRCLE is used to draw circles, ellipses and pie segments and even allows circles with off screen centres resulting in an arc being drawn on the screen.

In its simplest form DRAW may seem the same as LINE but instead of using coordinates, DRAW uses directional commands such as U 10 or up ten pixels. However, other sub-commands can be added to add colour or rotate the object and even magnify or reduce it.

AQUARIUS

GET and PUT together add the most exciting facility. Using GET any block of the screen can be defined and stored in a named array. This can then be reprinted anywhere on the screen using PUT. An obvious application of this is in creating animated graphics for games.

The range of new Basic commands is completed with CLS which clears the screen, EDIT a line editor and LOCATE which adds a PRINT AT facility. These, although useful additions, should really have been included as part of the regular Basic.

I was impressed by the facilities provided by the extended Basic but I'm disappointed that nothing was included in it to lift some of the restrictions placed on the choice of variable names.

Documentation

The documentation supplied with the Aquarius is quite simply excellent. It comprises a manual, a guide to home computing and some simplified instruction cards. The instruction cards, like the guide, are spiral-bound to a stiff laminate board which opens out to form a stand, so it can then be placed beside the Aquarius for easy reference.

The flip cards take the user from initial setting up to writing programs which demonstrate the colour and graphics of the machine. The directions on each card are clear and easy to follow, although they sometimes ask the user to type in Basic commands he may have yet to come across. To counter this, each card has frequent pointers to chapters of the guide where commands are fully explained. To round off an attractive package, each card has an index tab for easy access.

The guide to home computing is split into two main parts: a teaching manual followed by a comprehensive reference section.

The teaching manual is further divided into 11 chapters which deal with every operational aspect of the Aquarius. I stress the operational aspect since that is all this manual mentions leaving more involved technical data for more advanced volumes. This is fair enough since it is supposed to be a first micro.

Sprinkled throughout the teaching section are a number of 'road signs' or symbols which are designed to help the first time user understand.

There are seven road signs: KEY IDEAS explain concepts, TRY THIS gives short exercises, BY THE WAY adds additional notes, REMINDERS are warnings, GOOD HABITS introduce good procedures, COMPUTER TALK explains jargon and CONTROL SHORTCUTS illustrate the single entry keywords.

Each chapter is clear and concise and supplements its explanations of the keywords with annotated examples.

To complement the excellent teaching section there is the reference section. This is also subdivided into parts; the first being a 'what to use' index. This is in effect a list of actions a user may wish to do with the keywords required to do them. It is designed for the users who know what they want to do but don't know how. To help a beginner a further reference number is also given which refers to the next part which is an index of all the keywords, their syntax and use.

Finally, there is an appendix including a list of error messages and full details of the character set, colour and characters matrices.

To sum up, the manuals supplied with the Aquarius are comprehensive but only deal with the very basic operation of the computer. Thus, there is no need for the re-writes of the manual type books which fill the bookshelves. Instead, prospective authors should develop and build on this base to increase the user's skill until the Aquarius is pushed to its limit.

Although impressive the manuals are unfortunately written for the American market and are full of Americanisms, including a Californian phone number to contact for aid and assistance! Mattel UK has produced a supplement sheet to translate these Americanisms and it will be available with future machines. The company's phone number in the UK is 01-902 8602.

Software

Education:
Aquarius Logo is a program designed to teach fundamental programming techniques with the use of turtle graphics.

Using a cursor on the screen which is affectionately known as a turtle the user is taken from simple forward, backward and turn commands through to procedures, conditional branching and recursion. If the last few words mean nothing to you, then you will find Logo useful.

All these principles are introduced through exercises, most of which result in the turtle drawing a picture on the screen. The screen is split into two areas, a graphics area or 'turtle playground' and a command area so that the results of the commands can be seen immediately.

The commands are designed to be friendly in this most sociable program and even a young child will be comfortable using instructions such as HATCH to create a new turtle and MAKE to give a variable a value. Even the principles of animation are introduced by changing the shapes of the turtles into two halves of a running man.

Aquarius Logo also includes the use of the simple arithmetic operations: addition, subtraction, multiplication and division and even exponentiation and square roots.

Another feature of this version of Logo is list processing. Using simple instructions words, strings and sentences can be selected or created based on the word's position in a list that has been entered into the computer.

Benchmarks

BM1	1.4
BM2	6.8
BM3	14.6
BM4	15.1
BM5	16.6
BM6	25.7
BM7	36.8
BM8	68.6

All timings in seconds. For an explanation of the Benchmark programs, see PCW Vol5 No11, November 1982.

Using the above features, turtle graphics, arithmetic operations and list processing, the user can be led into writing programs that can be stored on cassette or printed on the printer.

Business:
Fileform and Finform are serious programs and to reflect this they are packaged and presented in a sober fashion. The boxes are large and formal and the instructions come in the form of spiral-bound user guides.

Fileform uses three modes so that pages of text can be created, edited and then saved for future use. The applications of this are numerous and include home filing, an address book or a limited word-processor.

Fileform, best described as a page editor, has three distinct modes as follows:

Insert mode is used to create blocks of text and features cursor controls which allow text to be entered anywhere on the screen.

Command and edit mode is to manipulate these blocks of text. The blocks of text can be saved or loaded from cassette and printed on the printer. There are also commands to enter Insert and Edit mode.

Edit mode uses both the command line and screen cursors, and is a full screen editor. The command line is for functions such as FIND and REPLACE whereas changes and deletions are done with the screen cursor.

Finform can be used in any application which requires calculations of information which can change. A good example of this is a home budget. Once set up such a home budget can be saved on cassette and altered when circumstances change.

It provides a window on a large workspace. This window can display, enter or change the contents of any of the 16000 cells. Each of these cells can contain text for headings, numbers for calculations or values which are the results of these calculations. Calculations can be performed on single cells, whole rows or columns and include useful functions which can return the minimum, maximum or average value of a specified range of cells.

Therefore, Fileform is a home filing system and Finform a worksheet program. However, both of these suffer from severe restrictions. The keyboard isn't suitable for adults, the printer doesn't produce acceptable output and cassette storage is too slow for these applications.

And you thought you had a good spreadsheet.

A business is only as good as its planning.

And good planning depends on finding the right spreadsheet.

Choose the wrong one and you may be making the first in a long line of mistakes.

That's why it pays to be careful. To make sure you get the best.

Which is why you should choose Multiplan.

Multiplan is a very special kind of spreadsheet.

It's simple enough for an inexperienced person to use easily, yet it still offers all the functions and operations you're ever likely to need.

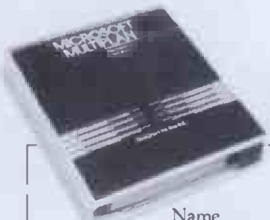
Which means you can undertake really complicated projects if you have to.

So whether you want to know how a 10% rise in inflation will affect the overheads, or what'll happen if your company's sales rise by 20%, you have all the answers at your fingertips.

Which means you can plan the future with confidence.

So if you want to get the most out of your business, fill in the coupon.

And let someone else sell the ice cream.



MULTIPLAN

Please send me further information on Microsoft Multiplan.

Name__________
Position__________
Company__________
Address__________
__________ Tel__________

Microsoft, Piper House, Hatch Lane, Windsor, Berks SL4 2QT. Tel (07535) 59951.

MICROSOFT®

Right. First time.

PCW/11/83

AQUARIUS

They are brave attempts to produce home-business software for adults for a machine that is used by their children. Unfortunately the facilities that make it suitable as a learning machine militate against the attempts at serious software.

Both Fileform and Finform are well documented and easy to use programs and obviously have some use, but don't expect too much from them. Fileform is not a true wordprocessor nor is Finform comparable to VisiCalc.

Games:
The games are attractively packaged and include the ROM cartridge, instructions and three overlays: one for the keyboard and the other two for the game controls. The keyboard overlay is in two parts so it will fit in the game box; this also allows it to lie flush with the keyboard unlike the Basic keyword template. The game control overlays are supplied with each game in case the owner has a mini expander, and they fit over the action buttons.

The selection of games available includes:

Tron deadly disks: an arcade style representation of the scene in the Walt Disney film of the same name. Our hero and nasty warriors are throwing what look like frisbees at each other. These are in fact deadly disks and should be avoided at all costs.

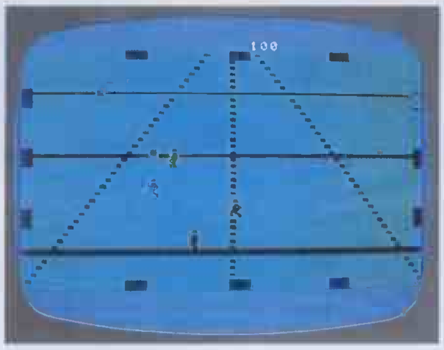
Utopia: a little less frantic and for two players, each playing the role of an island's leader. The object of the game is to create a better standard of living on your island than your opponent's.

Night Stalker: another game for the Aquarius, is basically Tron in a maze in which you must survive by shooting robots before they shoot you.

Prices

The pricing of the Aquarius reveals a clever piece of marketing by Mattel designed to mislead the opposition. When the product was first announced it had a price tag of over a hundred pounds. Thus the opposition dismissed it as being too expensive. But when the Aquarius was actually launched that price had dropped by £30. By the time you read this another £30 may have been deducted making it the first colour computer sold in this country for under £50.

Aquarius home computer	£49.95
4k RAM pack	£19.95
16k RAM pack	£29.95
Mini expander	£39.95
Printer	£139.95
Data recorder	£49.95
Software:	
All games	£12.95
Business & educational software (Finform, Fileform, Logo)	£30.00



Tron deadly disks

Burgertime: based on the arcade game. In my opinion, the best maze type game. This fun run in a fast food factory features Peter Pepper, the hamburger chef who must run round the maze and make giant hamburgers.

Future Expansion

An increasing range of cartridge software is only one of many future developments planned to expand the Aquarius.

The new range of cartridge software is supplemented by the introduction of cheaper cassette-based programs.

There are also two major new hardware products planned: the master expansion module and the home controller.

The master expansion module allows the advertised maximum RAM extension to 52k. But of more significance will be the twin disk drives and the ability to use CP/M software.

The home control system is connected to the Aquarius and can switch on or off any household appliance plugged into special socket modules anywhere in the home. In addition the controller can dim a light to any setting. All this can be preprogrammed and since it uses existing mains wiring, no additional cables are required.

Conclusions

The Aquarius is an excellent machine squarely aimed at the first time user. The machine is superbly supported by its manuals and is only let down by some curious aspects of its Basic.

Its retail price is in fact £30 lower than the original price tag and places it in the middle of the ZX81 and Spectrum/Oric range. This is, in my opinion, its natural position for its 16 colours are an improvement on the monochrome ZX81 but its poor keyboard and low memory will damage its comparison with the Spectrum. These feelings are echoed in the United States where Aquarius II has made its debut, sporting a full keyboard and 64k RAM.

Utopia

Burgertime/Night Stalker

Unfortunately there are no plans as yet to introduce this over here.

Having established its market position, the Aquarius supported by Mattel will still include many facilities, such as the cartridge software, which will sway potential buyers to it instead of its market-place neighbours. This may even accelerate the price war which already exists and might even herald the dawning of the age of Aquarius?

At the time of going to press Mattel was still deliberating over what marketing push to adopt for Christmas. The festive season brings a huge surge of interest in the micro market and there is hot competition as manufacturers compete to be Santa's first choice.

Aquarius faced three options:

Bundling the extra 16k RAM which currently costs an additional £29.95 for the same initial purchase price of £79.95.

Option number two was giving away free games software with the machine.

But the most potent option was cutting the price. Three possible prices were being bandied around Mattel: £69.95, £59.95 or a staggering £49.95 which would make the Aquarius the first colour computer to sell for under £50.

UK MD of Mattel was favouring the under £50 coup but was hitting opposition from the company's corporate bosses in the US. 'We'll have to solve this matter by mid October or we'll miss the boat,' he said.

END

Technical specifications

Processor	Z80
RAM	4k of which less than 2k is usable; can be extended by 4k and 16k RAM packs
ROM	8k basic
Keyboard	49 key membrane type
Screen	Domestic TV 40 x 24 or 80 x 72 screen display
Graphics	16 colours, 154 predefined graphic characters

SCHOOLPLAY

Educational software that is both fun and expedient is not always easy to find. Surya looks at some of the programs available for use by young children.

FACEMAKER

Program: Facemaker
Machine: BBC Model B
Publisher: Applied Systems Knowledge Ltd
Available from: Acornsoft outlets
Price: £9.95
Age range: 5-12 years

Facemaker is one of five educational programs currently produced by Applied Systems Knowledge Ltd (ASK). A further five should be available by the time you read this and versions will be available for the VIC 20, Dragon 32 and Atari micros.

A nice touch about this package of ASK educational software is the set of protocols presented on page two of the documentation. These protocols are not earth-shattering, but do explain two symbols and the effects of four keys (a hand pointing at a long bar means 'press the space bar', for example) but this kind of standard does much to improve the friendliness of packages used by young children.

Facemaker is a colourful 'identi-kit' program. The child chooses the person they wish to draw, and then answers a number of questions about the person's appearance. A picture of the person is gradually built up, and the option to go back and change parts of the face is periodically offered.

A typical question asks the child to 'think about Fred's eyes: are they large or small?' The child must then enter one of the options, in this case typing 'large' or 'small'. Younger children will need help reading the questions and typing in the answers, but the language is generally aimed at a sensible level.

When the appearance of each feature of the face has been decided, usually achieved by answering two or three questions, the features are confirmed in writing ('Fred's eyes are small and sleepy') and the child is then invited to examine the picture built-up to date with a 'Look!' prompt and the 'press space bar' symbol.

ASK intends the program to be used with small groups of children working together, and the documentation suggests a number of possible activities.

Documentation: Clear and straightforward.

Conclusion: Facemaker is designed to help children to learn sentence structure and increase their powers of observation. The program is likely to be somewhat limited in the former role since the text is the same each time the program is run, but the program is fun and likely to stimulate the imagination and visual awareness of children of all ages.

HIDE & SEEK

Program: Hide & Seek
Machine: BBC Model B
Publisher: Applied Systems Knowledge
Available from: Acornsoft outlets
Price: £9.95
Age range: 5-12 years

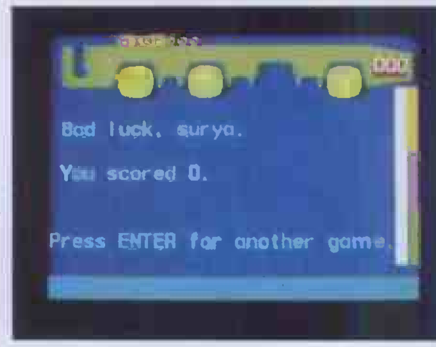
Hide & Seek is a beautifully written program, without doubt. Its educational value is, to my mind, somewhat less clear. The program is intended to test short-term retention and to aid in reading development.

It presents a set of pictures which are placed, either randomly or by the child, into a number of boxes. These boxes are then closed by means of 'shutters' and the child is asked to remember the contents of each box. The program offers four variations, one of which requires the child to correctly type in his/her response, the others use the increasingly popular combination of space bar and return key to step through and select from a list of options.

Hide & Seek is colourful and contains some extremely effective sound effects. However, despite this, and the attractive screen displays, I felt that the program would have little lasting appeal or usefulness.

Documentation: Good.

Conclusion: Nicely presented with good use of graphics, but of dubious educational value. There are far more suitable programs around for developing reading skills, and short-term memory retention may be useful for passing exams but has little to do with true education. Disappointing.



HOTDOG SPOTTER

Program: Hog Dog Spotter
Machine: 16/48k Spectrum
Publisher: Longman Software
Available from: Retail outlets
Price: £7.95
Age range: 4-8 years

Hot Dog Spotter is a program to develop children's counting skills. It is presented, and convincingly so, in the form of an arcade-style game.

A number of balls are dropped from the top of the screen. The child has to count the number of dots on the ball before it reaches the bottom of the screen. If successful, the spots are 'knocked off' the ball and the score increased. The quicker the child counts the spots, the higher his/her score. If a ball reaches the ground, one life is lost. The game ends when all three lives have been lost.

The skill level automatically adjusts itself to the score: the higher the score, the faster the pace. The number of spots also increases along with the speed. Towards the higher scores, the speed of the game is extremely fast making it challenging for older kids. Prior to reviewing the program, I saw it, plus kids in action, at the Longman press launch and it seemed to go down well.

Documentation: Brief but adequate.

Conclusion: A lot of educational programs make some sort of attempt to disguise themselves as games; with Hot Dog Spotter, Longman succeeds. It does nothing to develop children's numeric skills, but enables them to practise counting in an entertaining fashion and is probably worth having around for this reason.

COUNTABOUT

Program: Countabout
Machine: 16/48k Spectrum
Publisher: Longman Software
Available from: Retail outlets
Price: £7.95
Age range: 4-6 years

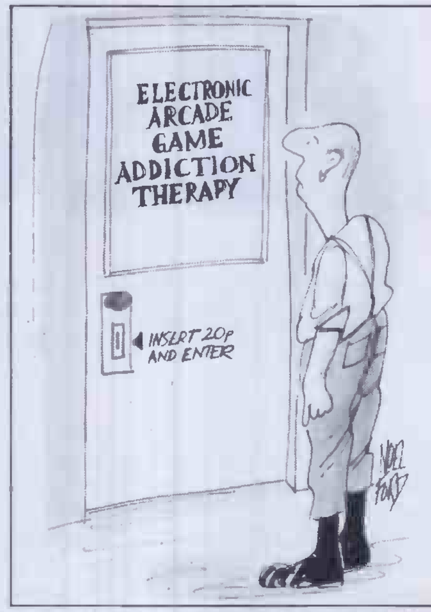
Countabout in intended to introduce children to the concepts of simple addition and subtraction.

Between one and ten everyday objects are presented in a box on the screen. By adding to or subtracting from the number of objects in the box, the child attempts to end up with a given total. If seven objects are presented, for example, and the child is asked to make three, he will have to subtract four.

A correct response results in the appropriate number of objects entering or leaving the box via little trap doors, a tuneless jingle is played and a monkey climbs a little further up a banana tree. After two incorrect responses, the correct solution is graphically displayed. The game ends when the monkey reaches the bananas.

Documentation: Brief but adequate.
Conclusion: Aside from the awful jingle (!), a very nice program. Likely to prove extremely useful as an aid to simple arithmetic.

END



NUMBERS COUNT

THE PERSISTENCE OF AN INTEGER

Mike Mudge muses mathematically

In the sequence 6788, 2688, 768, 336, 54, 20, 0, each term is the product of the decimal digits of the previous one; thus 6.7.8.8 = 2688.

The number of steps before a given integer collapses to a single digit (in the above example 6) is defined to be the *persistence* of that integer. (N Sloane, *Journal of Recreational Mathematics*, 6, 1973, pp 97-98).

The smallest integer with persistence n is denoted by y(n).

n	1	2	3	4	5	6
y(n)	10	25	39	77	679	6788

Notes:

(i) In binary (base 2) the maximum persistence is trivially 1, since only digits 0 or 1 may be present.

(ii) In base 3 (as used by the fi-st generation of Russian digital computers) the second term is zero or a power of 2, since only digits 0,1 or 2 may be present.

There is a conjecture that all powers of 2 greater than the fifteenth contain a zero when written base 3: (this is certainly true up to 2^{500}) this conjecture implies that the maximum persistence in base 3 is 3.

(iii) Sloane has conjectured that in base b there is a number, which he denotes by c(b), such that the persistence cannot exceed c(b).

(iv) Erdös has considered theoretically the case where one forms the product of the *non-zero* digits and asks how fast one reaches a single digit and for which numbers the descent is slowest.

Problem

Submit a program, or suite of programs, to investigate some of the following:

(a) To compute y(n) for n = 7,8,...,11. see M R Mudge, *Mathematics in School*, Vol 12, No 1, January 1983 for these results.

(b) To attempt to find y(12), it is known to be greater than 10^{50}.)as are y(n) for all n greater than 11.)

(c) To investigate the expansion of 2^m base 3 for m significantly greater than 500. See note (ii) above.

(d) To investigate the persistence of an integer in bases greater than 3, within the context of note (iii) above.

(e) To construct empirical evidence relating to the work of Erdös, note (iv), above, where any zero digits are excluded from the product.

All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order). A suitable prize will be awarded to the 'best' entry received.

Entries, to arrive by 1 January, 1984, to; Mr M R Mudge BSc FIMA FBCS Room 560/A, Department of Mathematics, The University of Aston in Birmingham, Gosta Green, Birmingham B4 7ET.

Note: Submissions will *only* be returned if suitable stamped addressed envelopes are included.

U-sequences

Responses to this problem tended to concentrate on the fundamental U-sequence, ($u_1 = 1, u_2 = 2$), several reaching $u_{20000} = 268553$ and beyond.

The algorithms used for construction were the obvious ones and run times were often great. Readers interested in accessing these working programs are reminded that this is a genuine research problem, with no known 'correct answer', but I would hope to be able to put them in contact with other U-sequence enthusiasts.

However, a fundamental error in Muller's work or its subsequent interpretation has been revealed, in fact approximately 36.4% of the terms differ by 2 and not the 60% quoted. Frantic attempts are being made (M.M) to obtain sight of Muller's thesis from The State University Of New York at Buffalo, so that his algorithm can be studied: readers will be informed as soon as this has been achieved.

Interested readers are also referred to M C Wunderlich's, *The Improbable Behaviour of Ulam's Summation Sequence, in Computers and Number Theory*, Academic Press, 1971, pp 249-257, for further information.

Those correspondents writing in Basic and reaching typically $u_{220} = 2034$ in the fundamental sequence or as far as u_{100} in a range of related sequences resulting from somewhat arbitrary choice of u_1 and u_2 are not really in a position to add to the existing empirical evidence.

The choice of a prizewinner this month has proved difficult, but in the context of originality and dedication it is Mr P J H Fox of 12 Plumpton Close, Luton, Beds LU2 8JU using Forth with many assembler definitions who has stored the U-sequence as a difference table pending further investigation. He has incidentally two successive terms differing by more than 255; readers may like to discover for themselves and maybe contact Mr Fox.

The prize of £10 will shortly find its way North, up the M1, roadworks permitting.

END

PHOTOFIT

By pretending to be a chemist and an ambulance driver John Higgins discovered a potential goldmine of software for the teaching of communications skills. Here's your treasure map and a sample program which invites you to join in the search for a notorious villain . . .

Computers are educational, or so we say when we try to justify buying them for our families. When it comes to buying software we may be disappointed. The programs one finds in the education section of the software catalogue generally do not teach; they test and even that is something they don't always do well. No wonder some teachers, parents and learners continue to be sceptical.

Language learning programs are a case in point. Nowadays language teachers believe that pure memory work must be balanced by at least an equal amount of time spent on activities where communication is the focus so that in the modern classroom one is likely to find people engaged in role-playing, problem solving, listening to authentic recordings and playing games. It is not now thought necessary to correct all mistakes on all occasions. Learners of any skill need opportunities to try out their newly acquired knowledge in order to communicate, and the computer can provide such opportunities.

The communication activities I have described are not only appropriate to language learning: indeed there may be masses of useful material designed for other subjects which, by translating the instructions, can be converted into language learning material.

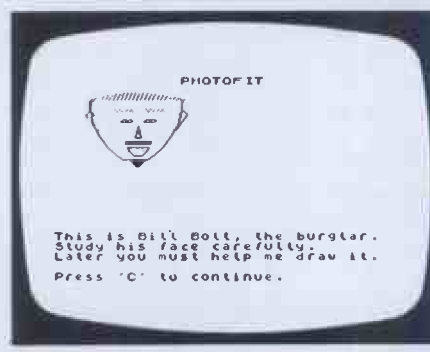
I recently visited the Control Data Corporation in order to see a demonstration of the CAL resource called PLATO. I was shown exercises on dangling modifiers and French irregular verbs, all of the drill-and-practice type, and was making polite noises and looking for an excuse to leave when I was asked 'Do you want to see any of our science material?' I agreed, and they called up a fractional distillation experiment. I had to assemble a diagram of the apparatus on the screen and control the distillation temperature while the computer reported back on the purity of the distillate. Next I tried an ambulance driver simulation and, since versions were available in English and French, I opted for French. I was summoned to the scene of an accident, told what equipment and supplies were in my ambulance and allowed to question the witnesses, including the victim's girlfriend — ooh la la! I so enjoyed chatting her up that the poor victim died, but in the course of the ninety seconds or so that passed in pleasant dalliance my French was exercised as never before. Here then was superb language teaching material unlikely ever to be used as such because it didn't appear in the language section of their catalogue. The same must be true in many schools. The science, geography and economics departments are likely to hold such buried treasures.

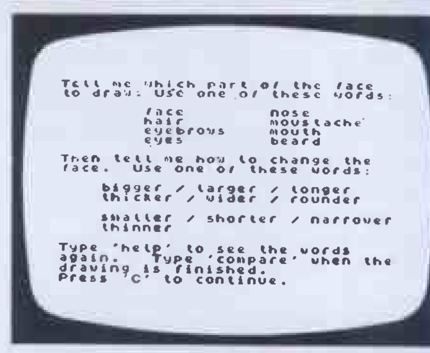
Many such programs must exist which can be used not only to fulfill their avowed function but to potentiate the kind of communication activity required for improved language learning, either in solo or group use. In the latter case two kinds of communication occur, the simplified formulaic utterances typed into the machine and the free conversation between group members as they discuss what to do next. The computer is both something to talk to and something to talk about. The added urgency of getting one's point of view across to the chap who is hogging the keyboard is a further stimulus to communication.

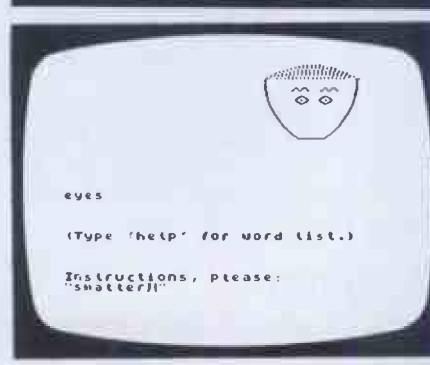
Photofit (for the 16k Spectrum) illustrates the kind of application program which, when used out of context, provides a game-like activity which will get people talking. More (much more!) sophisticated versions of this kind of program are used by modern police forces around the world, but the primitiveness of the drawing makes little difference to the educational value or the fun of the activity. It has been used with great enthusiasm by the overseas students with whom I work — they did not demand a Laughing Cavalier or an Al Capone. Though I wrote it originally for foreign students of English, I have also written a French version for the 48k Spectrum.

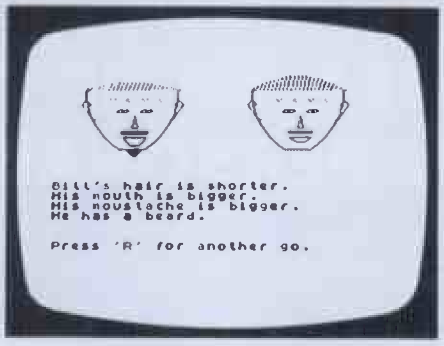
The program begins by drawing a random face on the left-hand side of the screen over the message 'This is Bill Bolt the Burglar. Study his face carefully. Later you must help me draw it.' This is followed by a frame of instructions, after which the screen blanks out and displays the prompt 'Instructions please'. The user types in a word for a feature, for example, 'face'. The computer now draws a face outline on the right-hand side of the screen. The user can leave this alone or change it by typing in 'larger' or 'smaller' or 'wider' or 'narrower', in which case the face is redrawn. Now the user types in the word for another feature, say, 'hair'. Some hair is drawn over the face. If the student now asks for the hair to be 'bigger', the machine will respond 'I can't draw bigger hair'. The student has to find the right word, which in this case is 'longer'. At any stage he can type 'help' which provides a list down the left-hand side of the screen of all the words the computer will recognise. When he has added 'eyebrows', 'eyes', 'nose', 'ears', 'mouth', and perhaps 'moustache' and 'beard', he can type 'compare'. Now the computer redraws the original face of Bill Bolt on the left-hand side, and lists all the differences below, for example, 'Bill's hair is shorter. Bill's nose is wider. Bill has no moustache'. If there are no differences, the message is 'A perfect likeness'.

What can one learn from this? Obviously there is an opportunity to practise vocabulary, the words for parts of the face the comparative adjectives, the fact that you can say 'long hair' but not 'big hair'. But what is most important is the fact that









this practice is not being presented as a language exercise, but is incidental to a memory problem. Learners may not even think of this as language practice but rather as a game. In that case they may learn more from it than they would from an ordinary exercise or translation task.

In order to squeeze the program into the space available on a 16k Spectrum, I have had to leave out all REMs and make use of a number of space-saving tricks. The following notes will be of use to anyone who has the 48k memory available or who wants to adapt the listing for another machine.

Notes:

1) Design

Initialisation is at line 1000. This calls up the subroutine at line 180 to create a random face and display it. There are three possible sizes for each feature, yielding more than 19,600 possible faces. The program then resets all the face variables to 0, calls up the instruction panel and prepares the screen.

The main program loop begins at line 1110. A copy of the previous input word is put into e$, and a new INPUT is made in d$. The input word is scanned and matched either to a noun ('face', 'hair', etc) or to an adjective ('bigger', 'narrower', etc). If a noun is recognised (lines 1120 to 1190), then any previous drawing of the feature is erased, the size variable is set to the middle value, and the feature is drawn on the right of the screen. A variable h (for 'hold') is used to record which feature was last drawn.

If an adjective is recognised (lines 1200 to 1260), then a variable com is set to 1 or −1. There is a check to see whether that adjective can be used with the current feature (in h). If so, control passes to lines 2010–2090, where the current feature is erased, the value of com is added to the current size variable, with checks to make sure that the size limits are not exceeded, and then the feature is redrawn in the new size. The cases where an adjective cannot be used with a particular noun (such as 'longer eyes' or 'bigger hair') are picked up at line 1360. This displays the message 'I can't draw a rounder beard' or whatever, and then returns to input. Notice that the program is sensitive to the use of the indefinite article, 'a'. All the nouns which need 'a', namely nose, mouth, moustache and beard, are in the lower part of the face, whereas hair, eyebrows, eyes and ears do not need the article. This simplifies the Boolean condition for selecting it.

If the input word is 'help', a subroutine at line 700 is called up which lists the program's vocabulary down the left-hand side of the screen in such a way that it does not interfere with the working drawing. The word 'compare' signals the end of the game and passes control to line 1500. Unrecognised inputs are greeted with the message 'I don't know that word'.

The end-of-game sequence at line 1500 begins by comparing the face on the screen feature by feature with the original face of 'Bill Bolt' stored in array b(9). Each difference is printed out in the form 'Bill's face is wider', 'His eyes are smaller', etc. Notice how the program selects 'Bill' or 'Bill's' for the first difference, but 'He' or 'His' for subsequent differences. This is done in the subroutines at lines 50 and 70 by PEEKing the cursor line. The selection of the right adjective in each comment is done by Boolean string assignment, something which is not available on all machines. Finally Bill's face is redrawn by using part of the original subroutine from line 200 (obviously leaving out the randomising statement at line 180).

The actual drawing routines are from lines 5010 to 5840. In each case the subroutine ending **10 erases the feature and the one at **30 redraws it in the new size. The face routine at line 5010 begins by wiping out any hair or ears that may have been drawn before, since the position of these depends on the size of the face.

2) Variables used in the listing

Drawing variables:

x for x-coordinate has values 32 (face on left) and 159 (on right)

y for y-coordinate has value 155 and is also used to identify line 155

Variables used as constants to save memory:

c = 12
z = 50
i = 1110

Other constants:

0 is replaced by NOT PI
1 is usually replaced by SGN PI
3 is replaced by INT PI

Counting variable is always j

Flag variable:

com has values −1 or 1, reset to 0 at each scan

Size and feature variables:

fa (face) has values	−5	0	5
ha (hair)	1	2	3
br (eyebrows)	1	2	3
ey (eyes	1	2	3
ea (ears)	1	2	3
no (nose)	1	2	3
mo (mouth)	1	2	3
ms (moustache)	0	1	2
be (beard)	0	1	2

h (current feature) 10 . . . 90

Array:

b(9) holds randomly drawn features of Bill Bolt

String variables:

d$ is current input
e$ is previous input

3) PEEKs and POKEs:

POKE 23609 in line 20 lengthens the bleep tone when a key is pressed.

PEEK 23689 in lines 50 and 70 reads the cursor line.

John Higgins has taught English as a foreign language in six different countries since 1963. He took up computing in 1980, and has produced a number of programs for language learners, mainly in the form of simulations or reading aids, using Sharp, Spectrum and NewBrain computers. He is the co-author, with Tim Johns, of a book, Computers in Language Learning, *to be published by Collins this month.*

```
 10 REM Photofit @ John Higgins
 1983
 20 BORDER 2: PAPER 7: INK 1: C
LS : POKE 23609,70: LET c=12: GO
 TO 1000
 50 IF PEEK 23689=c THEN  FRINT
 "Bill's ";: RETURN
 60 PRINT "His ";: RETURN
 70 IF PEEK 23689=c THEN  PRINT
 "Bill ";: RETURN
 80 PRINT "He ";: RETURN
155 PRINT "Press 'C' to continu
e.         "
160 IF INKEY$<>"c" THEN  GO TO
160
165 RETURN
180 DIM b(9): FOR j=SGN PI TO 9
: LET b(j)=INT (RND*INT PI)+SGN
PI: NEXT j
```

```
200 LET x=32: LET y=155: LET fa
=5*SGN (b(1)-2): GO SUB 5030
220 LET ha=b(2): GO SUB 5130: L
ET br=b(INT PI): GO SUB 5230
250 LET ey=b(4): GO SUB 5330: L
ET ea=b(5): GO SUB 5430
270 LET no=b(6): GO SUB 5530: L
ET ms=b(7)-SGN PI: GO SUB 5630
290 LET mo=b(8): GO SUB 5730: L
ET be=b(9)-SGN PI: GO SUB 5830:
RETURN
500 PRINT AT NOT PI,c;"PHOTOFIT
";AT 16,NOT PI;"This is Bill Bol
t, the burglar. Study his face c
arefully.","Later you must help
me draw it.": PRINT : GO SUB y
550 CLS : PRINT "Tell me which
part of the face","to draw. Use
one of these words:"
```

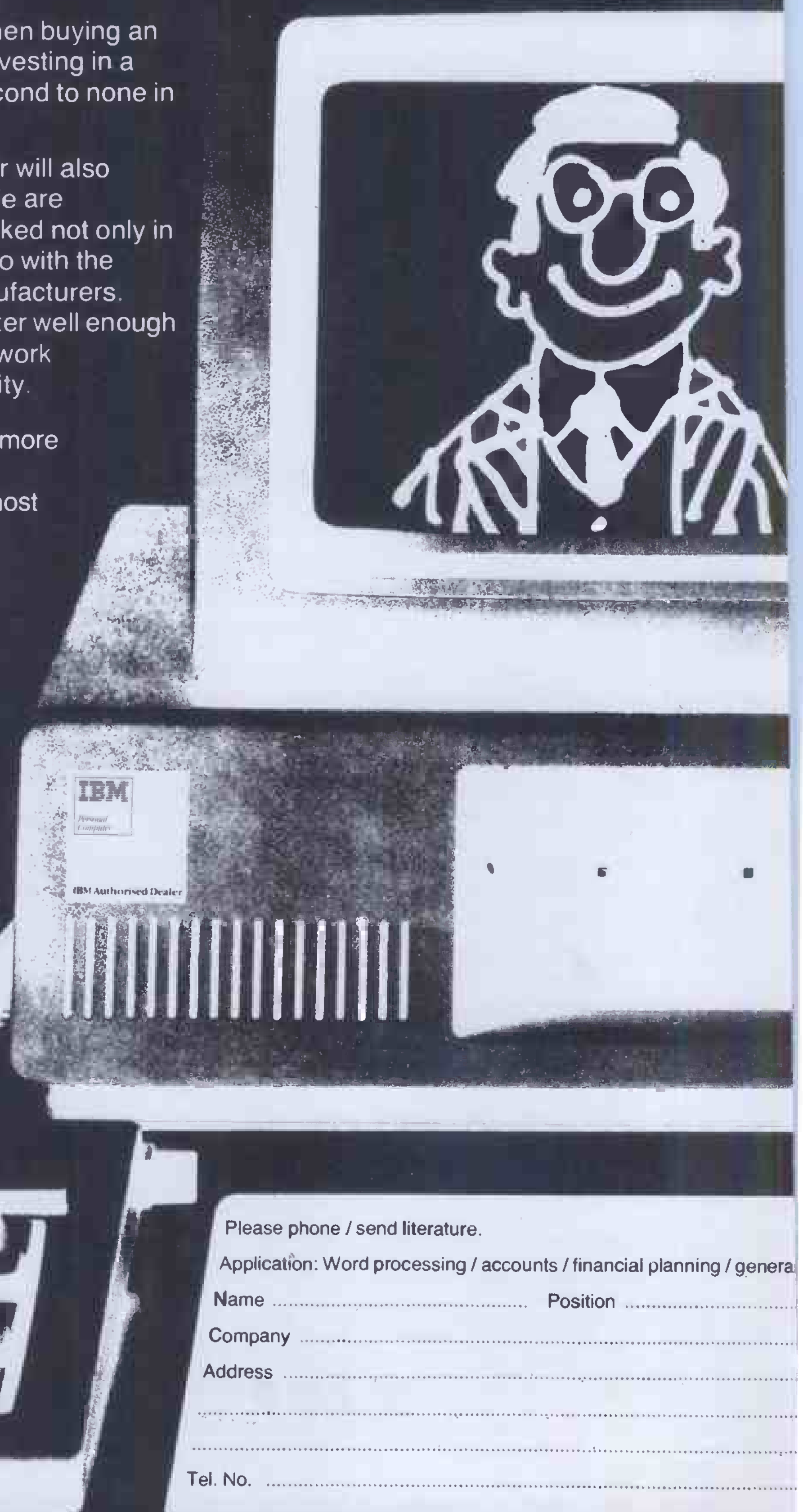
```
560 PRINT : PRINT  TAB 8;"face"
;TAB 20;"nose";TAB 8;"hair";TAB
20;"moustache"
570 PRINT TAB 8;"eyebrows";TAB
20;"mouth";TAB 8;"eyes";TAB 20;"
beard"
580 PRINT : PRINT "Then tell me
 how to change the","face.  Use
one of these words:"
590 PRINT : PRINT TAB 4;"bigger
 / larger / longer";TAB 4;"thick
er / wider / rounder"
600 PRINT : PRINT TAB 4;"smalle
r / shorter / narrower";TAB 4;"t
hinner"
610 PRINT : PRINT "Type 'help'
to see the words","again.   Type
 'compare' when thedrawing is fi
nished.": GO SUB y: RETURN
```

ABOUT THE DEALER OF YOUR FRIENDLY IBM PERSONAL COMPUTER

It is very comforting to know that when buying an IBM Personal Computer, you are investing in a machine that carries a pedigree second to none in the computing world.

As an IBM Authorised Dealer, Zynar will also contribute to your peace of mind. We are professionals. Many of us have worked not only in the computing industry itself but also with the world's 'blue-chip' component manufacturers. And, we know the Personal Computer well enough to have developed an end-user network system even before its UK availability.

As IBM consolidates its position with more software and peripherals, Zynar will continue to help you make the very most of your 'friendly' microcomputer and streamline your existing systems for faster growth and profitability.



ZYNAR

Zynar Ltd (PC Systems Division)
122/3 Uxbridge High Street, Uxbridge, Middx.
Tel: (0895) 59836 Telex: 896607

Please phone / send literature.

Application: Word processing / accounts / financial planning / genera

Name .... Position ....

Company ....

Address ....

....

....

Tel. No. ....

PHOTOFIT

```
 700 PRINT AT NOT PI,NOT PI;"I u
nderstand:": PRINT : PRINT "face
    hair": PRINT "eyes    nose":
 PRINT "mouth   beard": PRINT "e
yebrows": PRINT "moustache": PRI
NT : PRINT "bigger  larger"
 710 PRINT "longer  rounder": PR
INT "wider   thicker": PRINT "sm
aller shorter": PRINT "thinner n
arrower": PRINT : PRINT "compare
 help"
 720 PRINT AT 18,NOT PI;: GO SUB
 y
 740 PRINT AT NOT PI,NOT PI;: FO
R j=SGN PI TO 18: PRINT "
        ": NEXT j: PRINT "(Type
 'help' for word list.)": RETURN

1000 LET z=50: LET i=1110: GO SU
B 180: GO SUB 500: LET x=159: LE
T ea=NOT PI: LET ms=NOT PI: LET
be=NOT PI: LET br=NOT PI: LET fa
=-10: LET no=NOT PI: LET ey=NOT
PI: LET mo=NOT PI: LET ha=NOT PI
1100 CLS : BORDER 6: PRINT AT 1
8,NOT PI;"(Type 'help' for word
list.)": LET d$=""
1110 LET e$=d$: INPUT "Instructi
ons, please:",d$: LET d$=d$+"
   "
1112 LET com=NOT PI: PRINT AT 16
,NOT PI;"
         "
1115 PRINT AT 14,NOT PI;d$( TO 9
)
1120 IF d$( TO 4)="face" THEN  G
O SUB 5010: LET fa=NOT PI: LET h
=10: GO SUB 5030: GO TO i
1130 IF d$( TO 4)="hair" THEN  G
O SUB 5110: LET ha=2: LET h=20:
GO SUB 5130: GO TO i
1140 IF d$( TO 7)="eyebrow" THEN
  GO SUB 5210: LET br=2: GO SUB
5230: LET h=30: GO TO i
1150 IF d$( TO 4)="eyes" THEN  G
O SUB 5310: LET ey=2: GO SUB 533
0: LET h=40: GO TO i
1155 IF d$( TO 4)="ears" THEN  G
O SUB 5410: LET h=z: LET ea=2: G
O SUB 5430: GO TO i
1160 IF d$( TO 4)="nose" THEN  G
O SUB 5510: LET no=2: GO SUB 553
0: LET h=60: GO TO i
1170 IF d$( TO 9)="moustache" TH
EN  GO SUB 5610: LET ms=1: GO SU
B 5630: LET h=70: GO TO i
1180 IF d$( TO 5)="mouth" THEN
GO SUB 5710: LET mo=2: GO SUB 57
30: LET h=80: GO TO i
1190 IF d$( TO 5)="beard" THEN
GO SUB 5810: LET be=1: GO SUB 58
30: LET h=90: GO TO i
1200 IF d$( TO 6)="bigger" OR d$
( TO 6)="larger" THEN  LET com=S
GN PI: IF h<>20 THEN  GO TO 2000
+h
1210 IF d$( TO 6)="longer" THEN
 LET com=1: IF h<>10 AND h<>40 A
ND h<>70 THEN  GO TO 2000+h
1220 IF d$( TO 7)="thicker" OR d
$( TO 5)="wider" THEN  LET com=1
: IF h<>20 AND h<>40 THEN  GO TO
 2000+h
1230 IF d$( TO 7)="rounder" THEN
  LET com=1: IF h=40 OR h=70 THE
N  GO TO 2000+h
1240 IF d$( TO 7)="smaller" THEN
  LET com=-SGN PI: IF h<>20 THEN
  GO TO 2000+h
1250 IF d$( TO 7)="thinner" OR d
$( TO 8)="narrower" THEN  LET co
m=-SGN PI: IF h<>20 THEN  GO TO
2000+h
1260 IF d$( TO 7)="shorter" THEN
  LET com=-SGN PI: IF h=20 OR h=
80 THEN  GO TO 2000+h
1360 IF com<>0 THEN  PRINT AT 16
,0;"I can't draw ";("a "  AND h>
z);d$( TO 9);e$: GO TO i
1370 IF d$( TO 4)="help" THEN  G
O SUB 700: GO TO i
1380 IF d$( TO 7)="compare" THEN
 GO TO 1500
1390 PRINT AT 16,0;"I don't know
 that word.": GO TO i
1500 BORDER 2: PRINT AT 14,NOT P
I;"        ";AT 18,NOT PI;"
            ";AT c,NOT
PI;: IF fa<5*SGN (b(1)-2) THEN
 GO SUB z: PRINT "face is bigger
."
1510 IF fa>5*SGN (b(1)-2) THEN
GO SUB z: PRINT "face is smaller
."
1520 IF ha<>b(2) THEN  GO SUB z:
 PRINT "hair is ";("longer" AND
ha<b(2));("shorter" AND ha>b(2))
;"."
1540 IF br<>b(3) THEN  GO SUB z:
 PRINT "eyebrows are ";("thicker
" AND br<b(INT PI));("thinner" A
ND br>b(INT PI));"."
1560 IF ey<>b(4) THEN  GO SUB z:
 PRINT "eyes are ";("bigger" AND
 ey<b(4));("smaller" AND ey>b(4)
);"."
1580 IF ea<>b(5) THEN  GO SUB z:
 PRINT "ears are ";("bigger" AND
 ea<b(5));("smaller" AND ea>b(5)
);"."
1590 IF no<>b(6) THEN  GO SUB z:
 PRINT "nose is ";("wider" AND n
o<b(6));("narrower" AND no>b(6))
;"."
1610 IF mo<>b(8) THEN  GO SUB z:
 PRINT "mouth is ";("bigger" AND
 mo<b(8));("smaller" AND mo>b(8)
);"."
1630 IF ms=NOT PI AND b(7)>SGN P
I THEN  GO SUB 70: PRINT "has a
moustache.": GO TO 1660
1640 IF ms<(b(7)-SGN PI) THEN  G
O SUB z: PRINT "moustache is big
ger."
1650 IF ms>NOT PI AND b(7)=SGN P
I THEN  GO SUB 70: PRINT "has no
 moustache.": GO TO 1660
1660 IF ms>b(7)-SGN PI THEN  GO
SUB z: PRINT "moustache is small
er."
1670 IF be=NOT PI AND b(9)>SGN P
I THEN  GO SUB 70: PRINT "has a
beard.": GO TO 1800
1680 IF be<b(9)-SGN PI THEN  GO
SUB z: PRINT "beard is longer."
1690 IF be>NOT PI AND b(9)=SGN P
I THEN  GO SUB 70: PRINT "has no
 beard.": GO TO 1800
1700 IF be>b(9)-SGN PI THEN  GO
SUB z: PRINT "beard is shorter."
1800 GO SUB 200
1810 IF PEEK 23689=c THEN  PRINT
 : PRINT : PRINT "A perfect like
ness."
1850 PRINT : PRINT : PRINT "Pres
s 'R' for another go."
1860 IF INKEY$="" THEN  GO TO 18
60
1870 IF INKEY$="r" THEN  RUN
1900 STOP
2010 GO SUB 5010: LET fa=5*com-5
*SGN com*(fa/5=-com): GO SUB 503
0: GO TO i
2020 GO SUB 5110: LET ha=ha+com*
((ha<INT PI AND com=SGN PI) OR (
ha>SGN PI AND com=-SGN PI)): GO
SUB 5130: GO TO i
2030 GO SUB 5210: LET br=br+com*
((br<INT PI AND com=SGN PI) OR (
br>SGN PI AND com=-SGN PI)): GO
SUB 5230: GO TO i
2040 GO SUB 5310: LET ey=ey+com*
((ey<INT PI AND com=SGN PI) OR (
ey>SGN PI AND com=-SGN PI)): GO
SUB 5330: GO TO i
2050 GO SUB 5410: LET ea=ea+com*
((ea<INT PI AND com=SGN PI) OR (
ea>SGN PI AND com=-SGN PI)): GO
SUB 5430: GO TO i
2060 GO SUB 5510: LET no=no+com*
((no<INT PI AND com=SGN PI) OR (
no>SGN PI AND com=-SGN PI)): GO
SUB 5530: GO TO i
2070 GO SUB 5610: LET ms=ms+com*
((ms>NOT PI AND com=-SGN PI) OR
(ms<2 AND com=SGN PI)): GO SUB 5
630: GO TO i
2080 GO SUB 5710: LET mo=mo+com*
((mo<INT PI AND com=SGN PI) OR (
mo>SGN PI AND com=-SGN PI)): GO
SUB 5730: GO TO i
2090 GO SUB 5810: LET be=be+com*
((be>NOT PI AND com=-SGN PI) OR
(be<2 AND com=SGN PI)): GO SUB 5
830: GO TO i
5010 GO SUB 5110: GO SUB 5410: P
LOT  INVERSE 1;x-fa,y: DRAW  INV
ERSE 1;20+fa,-z,SGN PI: DRAW  IN
VERSE 1;20,NOT PI: DRAW  INVERSE
 1;20+fa,z,SGN PI: RETURN
5030 PLOT x-fa,y: DRAW 20+fa,-z,
SGN PI: DRAW 20,NOT PI: DRAW 20+
fa,z,SGN PI: RETURN
5110 FOR j=NOT PI TO 18: PLOT  I
NVERSE 1;x-5,y+j: DRAW  INVERSE
1;75,0: NEXT j: RETURN
5130 PLOT x-fa,y: FOR j=NOT PI T
O (62+2*fa) STEP INT PI: DRAW 2,
6*SIN (j/(3*fa/5+20))*ha: PLOT x
-fa+j,y: NEXT j: RETURN
5210 FOR j=SGN PI TO 5: PLOT  IN
VERSE 1;x+18-br,y-5-j: DRAW  INV
ERSE 1;10+br*2,NOT PI: NEXT j
5215 FOR j=1 TO 5: PLOT  INVERSE
 1;x+36,y-5-j: DRAW  INVERSE 1;1
0+br*2,NOT PI: NEXT j: RETURN
5230 FOR j=SGN PI TO 10+br*2: PL
OT x+18-br*2+j,y-9-SIN ((br-1)*j
): NEXT j
5240 FOR j=SGN PI TO 10+br*2: PL
OT x+36+j,y-9-SIN (j*(br-SGN PI)
): NEXT j: RETURN
5310 PLOT  INVERSE 1;x+18,y-18:
DRAW  INVERSE 1;10,NOT PI,ey: DR
AW  INVERSE 1;-10,NOT PI,ey: PLO
T  INVERSE 1;x+36,y-18: DRAW  IN
VERSE 1;10,NOT PI,ey: DRAW  INVE
RSE 1;-10,NOT PI,ey: RETURN
5330 PLOT x+23,y-18: PLOT x+41,y
-18: PLOT x+18,y-18: DRAW 10,NOT
 PI,ey: DRAW -10,NOT PI,ey: PLOT
 x+36,y-18: DRAW 10,NOT PI,ey: D
RAW -10,NOT PI,ey: RETURN
5410 IF ea=NOT PI THEN  RETURN
5415 PLOT  INVERSE 1;x-fa/2,142:
 DRAW  INVERSE 1;-ea*PI,NOT PI,P
I: DRAW  INVERSE 1;ea*PI+fa/PI,-
c: DRAW  INVERSE 1;ea,NOT PI: PL
OT  INVERSE 1;x+60+fa/2,142: DRA
W  INVERSE 1;ea*PI,NOT PI,-PI: D
RAW  INVERSE 1;-ea*PI-fa/PI,-c:
DRAW  INVERSE 1;-ea,NOT PI
5420 RETURN
5430 PLOT x-fa/2,142: DRAW -ea*P
I,NOT PI,PI: DRAW ea*PI+fa/PI,-c
: DRAW ea,NOT PI: PLOT x+60+fa/2
,142: DRAW ea*PI,NOT PI,-PI: DRA
W -ea*PI-fa/PI,-c: DRAW -ea,NOT
PI: RETURN
5510 PLOT  INVERSE 1;x+32,y-22:
DRAW  INVERSE 1;-2*no,-10: DRAW
 INVERSE 1;4*no,NOT PI: DRAW  IN
VERSE 1;-2*no,10: RETURN
5530 PLOT x+32,y-22: DRAW -2*no,
-10: DRAW 4*no,NOT PI: DRAW -2*n
o,10: RETURN
5610 FOR j=SGN PI TO ms+SGN PI:
PLOT  INVERSE 1;x+24-ms,y-34-j:
DRAW  INVERSE 1;16+ms*2,NOT PI:
NEXT j: RETURN
5630 IF ms=NOT PI THEN  RETURN
5635 FOR j=SGN PI TO ms+SGN PI:
PLOT x+24-ms,y-34-j: DRAW 16+ms*
2,NOT PI: NEXT j: RETURN
5710 PLOT x+24,y-40: DRAW  INVER
SE 1;16,NOT PI: DRAW  INVERSE 1;
-16,NOT PI,-mo: RETURN
5730 PLOT x+24,y-40: DRAW 16,NOT
 PI: DRAW -16,NOT PI,-mo: RETURN

5810 FOR j=SGN PI TO 6*be STEP b
e: PLOT x+31-6*be+j,y-z: DRAW  I
NVERSE 1;NOT PI,-be*j: NEXT j
5815 FOR j=-6*be TO -SGN PI STEP
 be: PLOT x+32+(6*be+j),y-z: DRA
W  INVERSE 1;NOT PI,be*j: NEXT j
: RETURN
5830 IF be=NOT PI THEN  RETURN
5835 FOR j=SGN PI TO 6*be STEP b
e: PLOT x+31-6*be+j,y-z: DRAW NO
T PI,-be*j: NEXT j
5840 FOR j=-6*be TO -SGN PI STEP
 be: PLOT x+32+(6*be+j),y-z: DRA
W NOT PI,be*j: NEXT j: RETURN
```

GARDEN OF EDEN

Chris Jones asks why the innovative computer industry resorts to eponymously naming its inventions.

It's funny how trends start.

Once upon a time — say, twenty years ago — when you wanted to wash your hair, you went down to the shop and bought a bottle of tarted-up detergent, which did the job perfectly well and left your hair shining, golden, silky and all those other things that shampoos are supposed to leave hair. That was fine for everyone except the marketing men, who did not see in such simplicity the ideal ongoing hair-cleansing scenario.

Suddenly shampoos became medicated, oiled, creamed, emulsified and/or fitted with chemicals (sorry, ingredients) for dry hair, greasy hair, normal hair (a vanished breed), problem hair, grey hair and baldness. This was just the beginning; the rapidly-growing number of manufacturers soon decided that more was needed to really satisfy the customer. Now, as I stroll through the local Boots, I sometimes wonder whether I am in a chemist shop or a delicatessen.

Shampoos come in a range of flavours that puts ice-cream and crisps to shame. You can drench your head in Wild Apple, Rosemary and Thyme, Rosehips, Pineapple, Hazelnut, White Nettle, Oil of Mink (I wonder how they get it out?), Alpine Herbs, Lemon, Oat Milk, and even (ye Gods!) Bran and/or Wheatgerm.

Whether this really does anything more for your hair than some post-war 'Hairo' is debatable. That these shampoos sell is, I suppose, self-evident.

However — I hear you cry — what has this to do with microcomputers? Is it relevant? Does it relate? Well, yes, at least peripherally. For the point at issue is the meaningless way in which some products become tagged with labels which bear no relationship at all to their function: and, in particular, the burgeoning natural history of the micro.

> *'With all this forestry, shrubbery and fruit about, the appearance of a matching fauna seems in accordance with ideas of evolution.'*

When it was just the Apple, one could stand it. It doesn't seem to have much relevance to data processing, but at least those famous US garage mechanics managed to resist the temptation to invent some weird phrase to fit the acronym, such as Automatic Personal Processor and Linked Electronics, or Amazing Profit Potential for Lapsed Electricians. This in itself was a remarkable and laudable departure from normal American corporate practice, although I notice that the company has not shown the same restraint over the Lisa (or should it now be LISA?).

But now! Ah, the bountiful goodness of nature. The average micro mag — not excluding this honourable publication — reads rather like Sutton's seed catalogue, with The World About Us thrown in for good measure. Browse through the pages and you will find Tangerines, Apricots, Tulips (from, naturally, Amsterdam), Pineapples and others. The Acorn might have spawned the Oaktree, and the Peach the Peachtree, but these are both woodland plants and are presumably barred from the neat rows of the Apple Orchard. Yet further afield, a quick search of the Kitchen Garden (Thought: Kitchens Inc would be a good name for a company; think about it) will reveal an abundance of Sage, presumably intended to save you thyme . . . sorry.

Bonsai is rather subtle, but I suppose it makes sense to fit all this greenery into as small a space as possible, especially trees which apart from all the rest have an honoured place in software design. With software trees come branches, roots, leaves and also root nodes, which remind me of something to do with peas and beans in O-level Biology.

With all this forestry, shrubbery and fruit about, the appearance of a matching fauna seems in accordance with ideas of evolution. Tigers stalk through the greenery, searching desperately for well-tooled hunters to despatch them; little Turtles with inky shells bathe amid the Swans, while overhead Wasps buzz, Ravens croak and Albatrosses (ouch!) glide serenely. Just over the border of strict reality are the strange and faraway lands where there be Dragons, and where the immortal Phoenix rises from the crashes.

And down in the underbush, of course, are the Mice. There are two different breeds: one seeks the way out of the jungle in the shortest possible time (often becoming neurotic as a result) while the other rolls around in Hitler fashion on one ball, controlling things. Despite this reproductive disadvantage, and in true murine fashion, the second sort seem to be breeding like . . . like . . . who said Rabbits?

I suppose I could be accused of overreaction. After all, poetic imagery is no bad thing *per se*, and is notably lacking in names like HX-20, PC, BBC B, M20, ZX81, MB16001, 64 or TI99/4A. Nor is it easy to think of a good name, as I can testify after spending a fruitless (sorry!) three weeks trying to find a name for my new BBC computing series (blatant plug). But for something as futuristic and — to many — science fiction-like as computers one would expect the SF-type names, which in fact are in the minority: names like Sirius, Pulsar, Dark Star, Electron and Helistar. The other sort of name famed in such as 2001 and Asimov's robots is the name formed from initials; but apart from the VIC it is hard to think of any. Such names are logical: but where the fruit, veg and livestock come in — apart from allowing shocking puns by feature writers — remains a mystery.

> *'Tigers stalk through the greenery. . . little Turtles with inky shells bathe amid the Swans, while overhead Wasps buzz, Ravens croak and Albatrosses glide serenely.'*

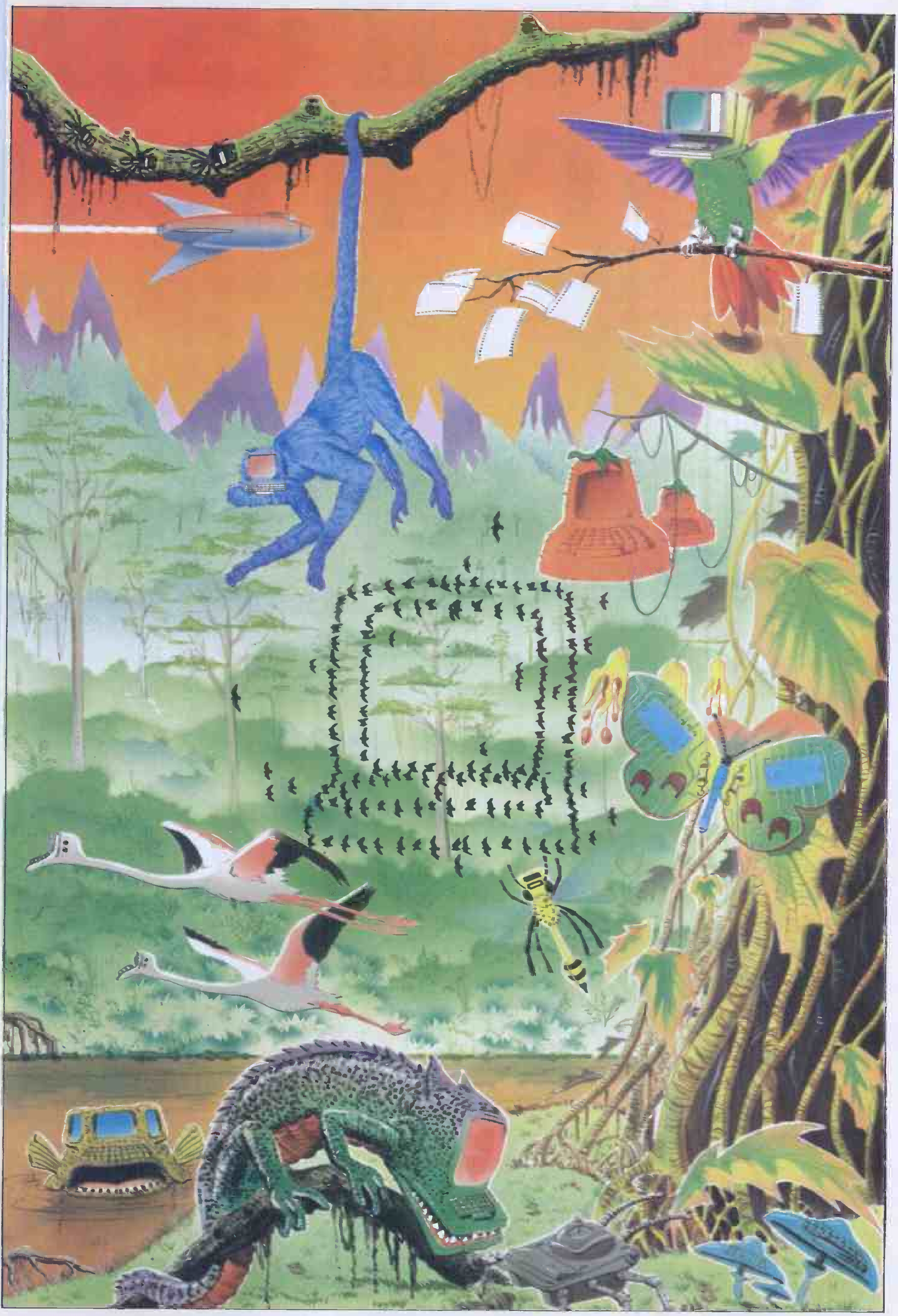
However, since the trend has irreversibly stuck, perhaps it should be extended more realistically. A colleague of mine, waiting a while ago for the BBC Computer he had ordered almost a year before, suggested renaming the then notional Electron as another atomic particle, the Quark: on the basis that this little fellow is thought by some physicists not to exist, while those who do believe in it can't find it. Applying this philosophy gives us some interesting new computer names.

The Strawberry, for example — despite the fact that mine are full of bugs and usually end up in a jam — would be ideal for a micro designed for use in nets. Mushrooms — apart from sometimes having magical qualities and causing hallucinations — are renowned for growing from what is politely referred to as organic fertiliser, and should be worth consideration by those manufacturers who advertise peripherals which they haven't actually yet got round to making. The new British Telecom electronic exchanges should, of course, be called Pomegranates, being — you guessed it — full of pips.

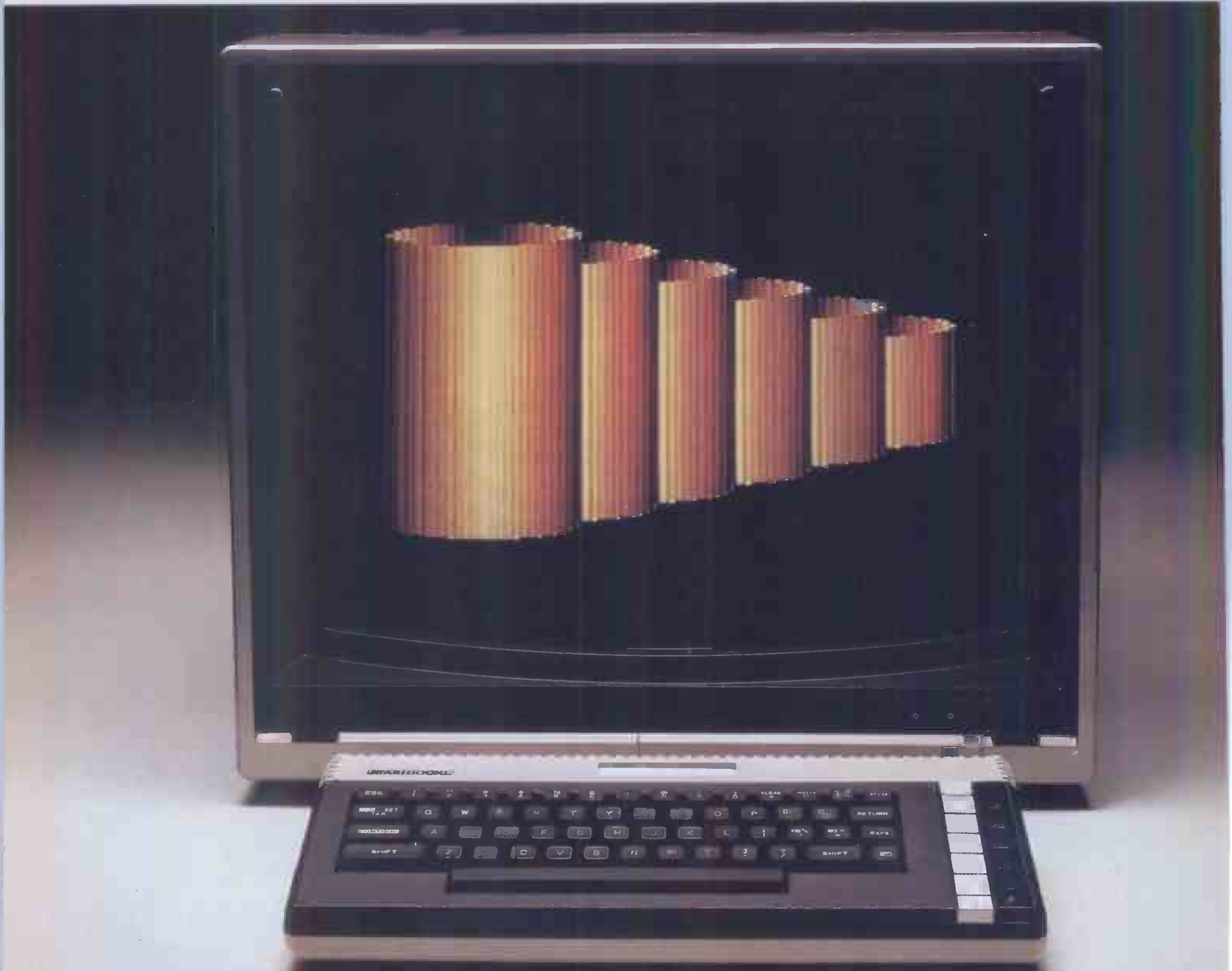
The Orchid blossoms only briefly and dies as soon as it gets onto your desk — someone *must* be able to use that. In the animal world, there is the Bat, for serious attention by various mail-order suppliers who fly by night and move very fast.

I could go on, but for two factors. One is that any name I dream up is likely to be on the market by the time this reaches print. And, besides, you might have more fun making them up yourself.

If not, don't worry too much. However poor or groan-inducing your ideas are, someone, somewhere in Cambridge, California or Tokyo is thinking of something much, much worse . . . END



As your exp
so can you



600XL Home Computer.

Whatever you want your home computer to do, the ATARI 600XL™ can do it.

ATARI 600XL product specifications.

Colour capabilities: 16 colours and 16 intensities. 256 shades.

Memory: 16K RAM expandable to 64K with memory expansion module. 24K ROM operating system including ATARI BASIC programming language.

Sound: 4 independent sound synthesisers. Each with a 3½ octave range.

Display: 11 graphic modes. 5 text modes. Up to 320 x 192 resolution. Maximum text display 24 lines by 40 columns.

Special ATARI integrated circuits: GTIA for graphics display. POKEY for sound and controller ports. ANTIC for screen control and I/O.

CPU: 6502C microprocessor. 0.56 micro-second cycle. 1.8 Mhz.

Extended graphics functions: High resolution graphics. Multi-coloured character set. Software screen switching. Multiple redefined character sets. Player missile (sprite) graphics. Fine screen scrolling. Changeable colour registers. Smooth character movement. Simple colour animation facilities.

Programming features: Built in ATARI BASIC programming language plus 8
languages. HELP key will provide addit
information and menu screens. Syntax
checking on entry.

Input/Output: External processo
for expansion with memory and periph
2 controller ports. Serial I/O connecto
Monitor output.

Software: Over 1000 items of softw
available including self teaching prog
with unique voice over. Education. Ho
management. Programming aids. Atar
written programs (APX). And Atari's fa
entertainment software.

rience grows
Atari 600XL.

1. Program Recorder.

2. 64K Memory Module.

3. Touch Tablet.

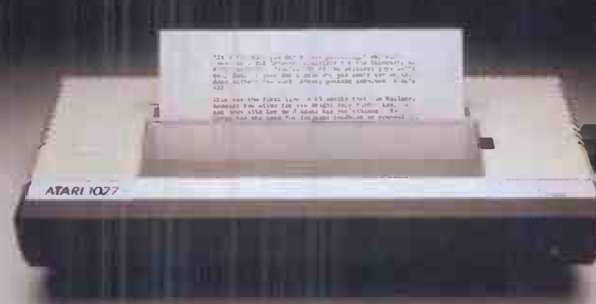
4. Trak Ball™ Controller.

5. Super Joysticks.

6. Colour Printer.

7. Disk Drive.

8. 80 Column Dot Matrix Printer.



9. Letter Quality Printer.

These peripherals will be available soon:
1. ATARI 1010™ Program Recorder for low 'storage and retrieval capability. Data smission 600 baud. Storage capability ‹ bytes on a 60 minute cassette. Track figuration 4 track, 2 channels (digital audio). Auto record/playback/pause trol.
2. ATARI 64K Memory Module gives the XL a massive 64K RAM.
3. ATARI Touch Tablet enables you to it pictures and draw diagrams, with the ch of a stylus.
4. ATARI Trak Ball™ Controller enables cursor movement in any direction; adds to the pleasure of Atari games.
5. ATARI Super Joysticks. Gives you a greater competitive edge over your games.
6. ATARI 1020™ Colour Printer plotter. Four colour graphic print capability. 40 column. 10 characters per second. 5, 10 and 20 characters per inch.
7. ATARI 1050™ Dual Density Disk Drive. 5¼ inch disks holding 127K randomly accessible bytes provides both expansion and flexibility for your 600XL system with DOS III.
8. ATARI 1025™ 80 Column Dot Matrix Printer prints 5, 10 or 16.5 characters per inch. 40 characters per second. Ideal for program listings, financial reports, etc.
9. ATARI 1027™ Letter Quality Printer for word processing letters in professional type.

If you'd like to know more about the ATARI 600XL, write to Atari International (UK) Inc., P.O. Box 407, Blackhorse Road, London SE8 5JH and we'll send you all the details.

The new Atari XL home computer system. ATARI®

®ATARI and design. Reg. U.S. Pat and TM Off. TM: Trademark of Atari Inc. The ATARI 600XL is compatible with ATARI 400 and 800 programs.

SOFTWARE

DATABASE BENCHTEST

OPTIMUM

Kathy Lang checks out Optimum, a multi-user data management package from the American company, Uveon Inc.

This month's data management package is rather different from most of those I've reviewed so far in this series. To start with, Optimum is billed as a true multi-user system, which includes the ability to lock items in records to prevent any clash between users trying to change the same record. Another major difference is that it has two distinct levels of operation, and indeed is sold in two 'packages'. The simple facilities which a non-technical user might require are provided by the 'Executive' version of Optimum, while these features plus a powerful range of facilities, including a form of programming language, are provided in the 'Professional' (used in the sense of computer professional) version. As a further extension, the routines in the Professional version can be used from compiled versions of Basic to give a powerful data handling subroutine library; by using the CHAIN command they can also be used from other languages.

Optimum runs under CP/M-80, CP/M-86, MS-DOS and PC-DOS as a single-user system, and under MP.M-86, DPCOS and NSTAR to provide multi-user facilities. Unfortunately I was not able to test the multi-user aspects of the system; the Benchtest was done under CP/M-80. Optimum is intended primarily for use on hard disk systems, so the supplier lent me an Almarc hard disk machine for the tests. The Benchmark timing tests were run both on the Almarc and on a single-user Sirius with a 6MHz, Z-80 card, and both sets of timings are quoted in Fig 4.

For the Executive user, there are three main parts to Optimum: file creation, data entry and amendment are handled by the forms processor; selection and ordering of information for display on the screen are provided through a general-purpose command called SELECT; and report formatting, which allows flexible report layouts on the printer or on the screen, uses a combination of the facilities of SELECT and of 'paint-a-screen' layout design. There is an initial menu which gives access to each of these three areas of the package, and further small menus are used to input commands during form and report processing.

However, as the Professional user soon discovers, all these features are actually sub-systems which may be accessed directly through the terminal interface, called the Terminal Control Language, and the experienced user can dispense with the initial menu altogether if preferred. The overall structure of the package, with a brief summary of the function of each command, is shown in Fig 1.

Optimum is an American package from Uveon Inc, and is distributed in the UK through two routes. My review copy was supplied by Professional Software Services of Birmingham, which is the sole UK distributor for every computer system except TeleVideo — that version is available from TeleVideo dealers.

Constraints

The global constraints in Optimum, such as file and field size, are not likely to cause too many problems; the major limitations are shown in Fig 2. However, the methods of indexing may be a constraint in some applications — see the section on file creation below for more details.

File creation and indexing

An Optimum file is set up by defining a form for it, and then telling Optimum to create a data file with a reasonable estimate of the number of records the file is likely to contain. You may exceed the limit, but extensions will not necessarily be contiguous with the original space, and access times may become a little slower as a result. Setting up the form involves, as a minimum, specifying the field name, type and length to the forms processor. Each record must have one unique key field, the first. If your data does not have such a field, you can ask Optimum to supply a unique record number, and this will be entered in the first field for each record when the record is first accessed. In addition, up to three other fields may be specified as cross-reference fields. Matching on these fields is by identity only. You have to specify the cross-reference fields when the file is created — you can't decide to add cross-reference fields after the file has data in it, except by writing a 'program' to delete each record and rewrite it. However, you can add extra fields to the file simply by amending the file definition.

The form can also be used to specify data checking, such as ensuring that data is numeric, lies in a particular range, or conforms to a 'picture' of what the item should look like. You can also provide files of permitted values against which entries can be checked — for instance, to ensure that an entry in a field for 'County' is one of the counties listed in a reference file. Default values can also be specified, which will be stored if the operator does not enter a value for those fields.

Data input and updating

In the Executive version of Optimum, information may only be entered and amended through the basic screen display form created when the file is set up. This does not permit cursor movement on the screen. A record skeleton is displayed, showing one field per line labelled with the field name. The user is then prompted (on the 25th line of the screen) for the value of each field in turn, and these values are then displayed on the appropriate line. To amend a field, you must terminate the current entry, type the number of the field you wish to amend, and then enter the new value.

You may identify the record to be added or amended by specifying its number or unique key value, or by entering one or more words (a word is a sequence of characters followed by a space) from the cross-referenced fields. If the information you enter does not match an existing record, then Optimum assumes you want to create a new one — but it does, sensibly, ask for confirmation before doing so. If only one record matches the value entered, then this record is displayed for amendment; if there are several which match, Optimum displays a list of the matching records and asks you to choose which one to edit. But when that editing is finished, you are returned to the normal prompt for a key field — you can't just browse through all the records which match, editing as you go. If the record you want to amend is in use by someone else, then you may — according to which field you decide to change — have to wait while the other user finishes with the field. Whether to wait, or to come back with a message saying that the operation has not been successful, depends on the option you request when the file is set up; this option is set for the whole file.

Data entry may also take place through an amended version of the basic screen display, or, in the Professional version, through a form designed with the help of the FORM-ED module.

Screen display

When records are retrieved for editing, they may be displayed using the standard format which shows one field per line. Alternatively, you can modify that format with FORM-ED, using a limited form of 'paint-a-screen'. This allows you to move the layout of fields, but doesn't seem to permit you to include some fields but not others. For this, it seems that you must go to the more extensive features in the Professional version, where you have full screen cursor control, calculation facilities and access to other files.

Retrieval for display uses a somewhat different set of formats. All such retrieval in the Executive version uses the TCL command SELECT (even if you want to display every record). The SELECT command uses an extensive range of options to construct what Optimum calls Micro-English sentences. SELECT has two modes, the simpler of which takes the form of issuing a command such as:-

SELECT STOCKFIL DISPLAY ITEM PRICE QUANTITY HOLD

where STOCKFIL is the name of a file of stock items, ITEM, PRICE and QUANTITY are the three items to be displayed. Unless told otherwise, SELECT will display each record in turn scrolling as it goes; if you want to display a screenful of information at a time and tell SELECT to continue when the screen has been read, then you must add the HOLD option as in this example.

As an alternative to this simple display format, you can customise the report to some extent by using another TCL command called SELECT-ED, which in the Executive version is accessed directly from the main menu. This command also provides a way of saving complete SELECT specifications for re-use. Using SELECT-ED, you can add headings, titles for field displays, and page-break instructions. Once completed, the report is saved, and may be printed or displayed from the main menu.

Whichever mode of SELECT is used, the Micro-English options provide the ability to select, sort and total within this single framework — more on this under the respective sections.

Selection

Records can be selected for display either by specifying keywords from cross-referenced fields, or by having the file read sequentially. When cross-referenced fields are used, the SELECT command might look like this:

SELECT STOCKFIL XREF "Socks" DISPLAY ITEM QUANTITY HOLD

This command would use the cross-reference index to find all records which included the word Socks in any of the cross-referenced fields. Cross-referencing is quite flexible; for instance, if you have a product called Orange Juice, and you can't remember if it is stored as 'Orange Juice' or 'Juice Orange', it doesn't matter — provided the product name field is cross-referenced, Optimum will locate the record(s) with those two words irrespective of order.

However, cross-reference access only works for cross-referenced fields, and only matches on identity — no other comparisons, and no 'wild' character matching.

Menu Options →	TCL Command	Function
T	any	
D →	DEFINE	Define data file directly
D	FORM	Invoke forms processing sub-system
F form identifier	FORM-ED	Edit form created in FORM or DEFINE
	FILE-UTILITY	Housekeeping functions to create and delete files under user control
	COPY	Copy all or part of a data file
	INSERT	Merge records from one data file into another
	DELETE-ITEM	Delete records in an Optimum file as a batch process
	DELETE-LOCKS	Eliminate unwanted file locks on multi-user systems
R report identifier →	SELECT (REPORT)	Selection, sorting and display of data records requested by user command (from stored commands)
S →	SELECT-ED	Front-end to SELECT for creation of formatted selective reports
	BUILD-LIST	Prepares list of record identifiers for use by other commands
	SAVE-LIST GET-LIST COPY-LIST DELETE-LIST	Commands for saving, restoring, copying and deleting lists of record identifiers
	POINT SHOW	Utilities used in parameterising file naming
	TYPE/PRINT/IED	Display/print/edit Optimum text files
EX →	LOGOFF/LOGTO	Exit this username/Exit this username and login to another
	SUBMIT	Execute stored set of TCL commands
	HELP	Get more information on TCL commands or sub-system commands
	DATE	Set or display system date
	EX	Exit from TCL to menu

Fig 1. Terminal Control Language commands and menu structure

```
Prompt Processing
  Prompt Number and Message
    Prompt location, character, length, error, data, required
1 Processing Record:
      0010, ., 1, 0023, , Not Required
I—  1 OF — Open File          :I;1;SELECT0.LST
I—  2 IF Error                :DE — Display Error :1
I—  3                         :EF — Exit Form :
I—  4 RN — Read Next          :1
I—  5 IF Error                :CF — Close File :1
I—  6                         :EF — Exit Form :
I—  7 IA — Item Access        :B:PCWBTDAT;$2
I—  8 AR — Arithmetic         :$2,PRICE3.D+1
I—  9 MV — Move               :$0,0;$2,PRICE2.D
I— 10 UP — Update             :$2
I— 11 AR — Arithmetic         :$4,0+1
I— 12 MV — Move               :$0,0;$4,0
I— 13 DA — Display At         :20;10;5
I— 14 SK — Skip               :4
Error Messages
1  'LST' FILE NOT FOUND
```

Fig 3. Processing for Benchmark 8

More extensive selection is provided by the WITH option in SELECT.

For instance: SELECT STOCKFIL WITH PRICE<10 DISPLAY ITEM PRICE HOLD

would find all the items with a price less than £10, and display the item code and price. Matching operators available include the usual range of comparison operators (<, > etc), plus ? to match any character and # to match any group of characters. Where several tests are needed, brackets may be used to ensure correct ordering, and OR and AND used to connect tests — that is, you can select records which pass all tests, any one test, or any combination that you can construct with AND and OR. All these facilities are provided in the Executive version; as usual, more extensive facilities still can be assembled using the 'programming' facilities.

Both cross-referenced and sequential selection may either be carried out right away, or the commands stored in a report file and used later, as often as necessary. It is unfortunate that cross-referenced selection is only available on up to three fields, and that you must decide on those three fields at the beginning. (A Professional user is provided with the tools to effect a change of mind later, but this involves writing a program which will have to perform one read and one write for each record, as well as the indexing.) For while cross-referenced selection is quick, sequential selection is not very fast — see the timings in the Benchtests in Fig 4.

Sorting

Sorting of records for a report (on the screen or printed) is achieved by another Micro-English parameter to SELECT, the BY option:

SELECT STOCKFIL BY ITEM DISPLAY ITEM QUANTITY HOLD

would show all the records in the file in ascending order of item code. Up to fifteen sort fields may be specified, and you may display records sorted in ascending or descending order.

Calculations

Another SELECT option allows you to total on any numeric field when displaying or printing records. No other calculations are permitted in the Executive option, though calculations with the usual arithmetic operators and brackets are permitted in the Professional version. So to carry out the Benchtest in which a field in each record is replaced by a calculation based on another field, an Optimum forms processing program had to be written. As an example of a very simple Optimum program, the processing statements in that program are shown in Fig 3.

Multiple files

There is no provision within the Executive version of Optimum for setting up the use of multiple data files (other than the files of permitted responses used to validate data entries). Within the Professional version, it is possible to exploit the dictionary facilities to access up to three data records from any number of files at the same time. This is achieved by allowing you to have any number of files open at a time, and providing three file buffers in memory, each capable of holding a single record read from any open file.

Tailoring

Two levels of tailoring are possible using the Professional version. The extensive forms processing facilities allow quite flexible tailoring of applications, including full control over screen display and retrieval, up to three data files open at a time, access to the cross-referencing and indexing features of Optimum, and commands to allow repeated and conditional execution. Alternatively, these facilities can be included as subroutines in compiled versions of Basic, so that they can provide a library of standard functions for a system builder who also needs the facilities of a programming language. (When control is returned from Optimum to the calling program, all necessary pointers are stored in a work file, so that you can return to the point from which you left without having to preserve memory.) Through the CHAIN command the functions can be made available in other languages, too. For system builders at whatever level, it is possible to buy a run-time licence for Optimum, giving the ability to sell just the customised version at a reduced price for the Optimum facilities.

Security and reliability

Optimum uses a system of user identifiers plus passwords on those identifiers. This feature, combined with the use of an Optimum directory for each user showing the forms available to that user, makes it possible to allow access to particular information only to authorised users. Passwords are not obligatory, though — you must take the initiative to set them up. If you request it when a data file is set up, each item will be locked when accessed, so that there is no danger of conflicting attempts to change the same field.

Links with outside

SELECT includes a facility for building a text file, so it is possible in the Executive version to write a data file which can then be read by other programs — word processing programs, for instance — or shipped onto a mainframe if you are working in a distributed processing environment.

Going the other way, converting an ASCII sequential file into Optimum format can only be carried out in the Professional version, and requires a modicum of understanding of the programming features, but is then quite a simple matter.

Max file size	Operating system limit
Max no records	Limited only by maximum file size
Max size record	CP/M: 4-5k characters; 16-bit systems: 12.5k characters
Max no fields	50
Max field size	255
Max no keyfields	1 main key, 3 cross-referenced key fields
Field types	Character, Numeric, Date

Fig 2. Constraints

OPTIMUM

The Benchtest for this was quite slow, because it used a generalised method to make it comparable with other packages. However, since you have the facilities for 'tweaking' the method (not always provided in other packages), in practice it could well run quite a bit quicker.

User image

As is so often the case, I found Optimum rather a mixture in terms of ease of use. The Executive version is reasonably easy to use, once you get used to the rather unusual structure with virtually all retrieval (other than for editing records) being handled by the single command with many options. There are some inconsistencies, though. For instance, all sub-processes such as form editing and report editing can be accessed directly through the Terminal Control Language commands, but only some of them can be used from the main menu without going into TCL. The simple version of SELECT, which allows display of groups of records interactively, is used by going into TCL and then issuing the SELECT command. But the report formatter, which uses a more extended version of SELECT, is accessed direct from the menu.

Another contrast is provided by the help available on the screen and the error messages. Every response to a user command is accompanied by a reference to a part of one of the manuals. At most points where the user is expected to take some action, you can type HELP and a list of available actions is displayed. The main menu always displays all the forms and reports available to the user along with the main menu, so you don't have problems remembering what on earth you called your data file. Whatever you are doing, Optimum displays some 'context' information at the top of the screen so that you don't get lost.

On the other hand, the error messages were at times distinctly unhelpful and the 'default' actions weren't always sensible. Also commands may not be abbreviated and must be typed in upper case.

The Professional version includes a great many powerful facilities, but the language used for forms processing was not the simplest I've seen.

Documentation

Optimum comes with three manuals, an Executive manual and two Professional manuals, one of which is for reference and the other an Applications Notebook with lots of examples. The Executive manual was good and easy to use, with one example built up over the various chapters, and another complete example at the end. The other two manuals I found extremely hard going, mainly, I think, for two reasons: there is a tremendous gulf in style and approach between them and the Executive manual, and there is very little attempt to give the reader an overall picture of the system, what it can do and how it does it, before diving into complex detail about particular features.

Conclusions

True multi-user data management systems are few and far between, and for this reason alone Optimum is worth a good look. As to facilities: as a system developers' package the Professional version has a lot of advantages, once you get over the initial learning curve. The Executive version could be suitable for you provided you didn't want to do any calculations other than totalling, and if your data is sufficiently well defined for three cross-reference fields to be sufficient for most interactive access. Optimum would also be more appropriate to a hard disk than a floppy disk environment.

END

		Almarc (hard disk)	Sirius* (floppy disks)
BM1	Time to add 1 new field to each of 1000 records	Time to modify definition file	
BM2	Time to add 50 records interactively	two seconds + data entry time	
BM3	Time to add 50 records 'in a batch'	NT	NT
BM4	Time to access 50 records from 1000 sequentially on 25-character field	25mins 35secs	57mins 20secs
BM5	Time to access 50 records from 1000 by index on 25-character field	NA+	NA+
BM6	Time to index 1000 records on 25-character field	NA	NA
BM7	Time to sort 1000 records on 5-character field	26mins	56mins 56secs
BM8	Time to calculate on one field per record and store result in record	47mins 30secs	1hr45mins
BM9	Time to total three fields over 1000 records	25mins 15secs	57mins 20secs
BM10	Time to import a file of 1000 records	3hr 35mins	3hr 35mins

Note: * Sirius times are estimates scaled up from times for 250 records.
NA = Not Available NA + = Not available as tested — key must match exactly

Fig 4. Benchmarks

Summary

Package Type	Multi-user data management with item locking, fixed format fixed length records. Combination of menus and commands.
Facilities	Data entry via fixed or variable formats, keyed access using up to four fields, variable report formats, sequential access on any field(s) using AND and OR plus comparison operators and 'wild' characters, sorting and totalling, all in Executive version. Professional version has powerful programming facilities which can also be used as sub-routines.
Drawbacks	Keyed access decided at file creation and limited to four fields, limited browsing when editing, not very quick for simple tasks.
Ease of use	Rather clumsy user image — all right once you get used to it. Good HELP on the screen, plenty of context information.
Error Messages	Not very helpful in themselves, but include references to further information.
Documentation	Executive manual good, Professional manuals dense and turgid.
Costs (ex VAT)	Executive version £225. Upgrade to Professional £225. Professional version £450. Run-time version £75. Multi-user prices negotiable.
Supplier	Professional Software Services, 480 Grovely Lane, Rednall, Birmingham B45 8UD. Tel: 021-445 1039
Acknowledgements	Grateful thanks to Westwood Computers, Birmingham, for help with disk conversion, and to supplier for loan of hard disk system.

CHECKOUT

FX SYSTEM

Motivated by the challenge to 'build a computer for under £70', Steve Mann gets down to basics with the FX system from Electroni-Kit.

Now, here's an oddity . . . Have you ever wandered around the kit department of Hamley's and observed the plethora of build-it-yourself packages, aimed at the younger end of the market, covering such topics as chemistry, physics, electronics? Well, now you can buy the FX System from Electroni-Kit, which purports to give the user a grounding in both electronics and computing, with the aid of a single unit that can be used either as a circuit board for building up electronic circuits or as a small computer, designed to teach the rudiments of machine code.

Main unit

The FX System is housed in a black and grey plastic case, measuring 22 x 21.5 x 4cms. A clear plastic lid covers the working area; this is hinged and when it is lifted the user has access to the computer panel and electronic components. Top right is a 6cm-diameter speaker grille; top left is a compartment that houses either a melody/clock unit or — as in the case of our review model — a CdS unit containing a light-sensitive cell; and in the centre is the power switch, volume control and red pilot light. Power comes from six HP7/AA-type batteries supplying nine volts.

The electronic components and the computer panel simply slot into place in the work area: the components themselves are mounted in small green-tinted translucent blocks with springy metal strips on each of the four sides — there are 66 locations on the board and the ingenious design enables circuits to be built up and broken down at will, with no soldering and no fear of a bad connection. In addition, there are two wires — red and black — each with a thin metal, spade-shaped connector at each end. These may be wedged into place between two components or mounted in a small plastic clip. The unit is certainly portable — it weighs no more than a couple of pounds and has a convenient handle for lugging it about.

The electronics

Contained in the FX kit are 29 different blocks, containing resistors and capacitors of various values, a diode, a transistor, a transformer, a 9-volt lamp and a key switch. There are also various connecting blocks that house no components but simply allow current to be passed through. These are configured in different ways to allow current to be passed from any one side of a block to any one side of another. Each block is clearly marked in white with the symbol and value of the component within. To use the electronic components, the computer panel is first lifted out of the work area, allowing access to all 66 compartments. Connection to the rest of the system — the speaker and the cadmium sulphide photoconductive cell — is by way of 18 metal contacts around the four sides of the work area. The contacts along the top are clearly labelled with their functions.

Accompanying the kit is a manual detailing 65 electronics projects. These feature the circuits beloved by all such kit manufacturers for generations — morse code, electronic organ, siren, etc — but are none the worse for that. The manual takes nothing for granted — it begins by explaining how to fit the batteries and leads into a thumbnail description of the various components, detailing the symbol used for, and the function of, each in turn. The projects themselves begin with the simplest circuit of all — connection of a lamp to a battery — and build from this, introducing new components in order. For each project, the manual provides a clear representation of the board and components, together with a conventional circuit diagram, a couple of paragraphs of explanation and some suggestions for further experimentation. Occasionally you are asked to make your own components — for example, a thick graphite line made with a soft pencil is used as a variable resistor, and in another experiment a capacitor is constructed from aluminium foil and the pages of the manual itself. The final few pages of the manual contain skeleton diagrams for the user to complete with details of new circuits.

Although there's nothing startlingly new in this electronics kit, the slot-together components and standard of construction make it very easy to use. The manual is easy to follow and not overburdened with jargon: it contains a few errors but these are corrected in an errata slip. Although the projects are simple, they should provide the groundwork for a good understanding of the functions of the various components.

The FX Computer

By removing the various electronic components and slotting in the computer panel, connecting it to the power supply by way of two wire links, simple machine code routines may be developed and run. The 'computer' itself is simply a rectangular panel with seven LEDs, a larger LED which displays a single hex digit, and 20 calculator-style keys. The keys are numbered O-F, with do-re-mi markings on 14 of them, and there are four function keys, displaying 'ADR SET', 'INCR', 'RUN' and 'RESET'. On the tiny circuit board behind the display are a handful of electronic components and a solitary 1312 chip. This is a 7-bit system — with seven binary LEDs the maximum number handled by the system is 127.

The manual gives a short test routine, involving playing a few notes from the electronic organ project. The user is then invited to play with the keyboard — every

The tiny circuit board houses a 1312 chip

time a key is pressed the corresponding value is displayed on the hex LED — and to try out the binary LEDs.

Once the user has gained familiarity with the system, the manual continues with a brief explanation of binary and hex, before going on to the first of the 100 computer projects included. Seven very simple games are permanently stored in ROM, but the bulk of the manual is taken up by explaining the use of the various registers for manipulation of code. This is where the

GOTO page 243

The plastic lid lifts up to allow the user access to the computer panel and the electronic components

PCW SUBSET

Alan Tootill and David Barrow present more useful assembler language subroutines. This is your chance to help build a library of general-purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. PCW *will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to SUB SET,* PCW, *62 Oxford Street, London W1A 2HG.*

6502 MATRIX TRANSPOSITION

The challenge issued in June SubSet to transpose a matrix in its own space has prompted the submission of a fairly good reason for turning arrays from Dr M J McCullagh of Nottingham University and an 'own space' transposition routine from Vernon Webb of Shelsley Beauchamp in Worcester.

As a lecturer in Geography, Dr McCullagh uses array grids of heights to represent terrain. Obtaining views of the same area from different locations requires the arrays to be rotated, usually in 90° twists. On micros with limited memories, these rotations have to be carried out within the original matrix space.

TRANS from Vernon Webb is a routine to transpose rather than rotate — that is, it changes linear storage from row after row to column after column. Apart from a few bytes of page zero use for pointers and temporary variables, no workspace other than the memory used by the original matrix is needed.

But is the algorithm used by TRANS the most efficient for such a transposition? The number of exchanges is small for very small matrices (5 exchanges for a 2 by 3 matrix) but increases rapidly — 105 exchanges are needed for a 4 by 6 matrix. Is there an algorithm to transpose or rotate an m by n matrix in only mn exchanges?

DATASHEET

```
;= TRANS - Own-space Matrix Transposition
;/ CLASS:  2 (not re-entrant, M4 to M8 corrupted)
;7 TIME CRITICAL?:  No
;/ DESCRIPTION:  Transposes a 2-dimensional array or matrix in
;/               RAM.  Sequential row storage becomes sequential
;/               column storage, or vice versa.  Maximum number
;/               of elements is 256.
;/ ACTION:  For each column (i) do:
;/              For each element (j) in column i do:
;/              Move element at (k) to new position at (l),
;/              right shifting intermediate elements l to k-1
;/              to l+1 to k.
;/             Next j until j=m - 1.
;/            Next i until i=n - 2.
;/ SUBr DEPENDENCE:  None
;/ INTERFACES:  RAM used for matrix.
;/ INPUT:  M0,M1 = address of matrix
;/         M2 = number of rows (m)
;/         M3 = number of columns (n)
;/         (m *n must not be greater than 256)
;/ OUTPUT:  Matrix at (M0,M1) transposed in own space.
;/ REGs USED: M0 to M8 inclusive.
;/ STACK USE:  4
;/ LENGTH:  102
;/ PROCESSOR:  6502

TRANS:    PHP            ;save registers.                    08
          PHA            ;                                   48
          TYA            ;                                   98
          PHA            ;                                   48
          TXA            ;                                   8A
          PHA            ;                                   48
          LDA    #$FF    ;initialise column pointer i to     A9 FF
          STA    M4      ;-1 for zero value in loop when     85 ZZ
          LDA    #0      ;first used.                        A9 00
          SEC            ;initial'se column start disp.      38
          SBC    M2      ;id to -m for zero value in loop    E5 ZZ
          STA    M5      ;when f.rst used.                   85 ZZ
NEWCOL:   INC    M4      ;column count to next column.       E6 ZZ
          LDA    M5      ;calculate displacement to column   A5 ZZ
          CLC            ;start from matrix start.           18
          ADC    M2      ;                                   65 ZZ
          STA    M5      ;                                   85 ZZ
          STA    M8      ;initialise l to col start disp.    85 ZZ
          LDA    #0      ;initialise element index j         A9 00
          STA    M6      ;to zero.                           85 ZZ
NEWEL     INC    M6      ;next element in column.            E6 ZZ
          LDA    M5      ;get id and use it to calculate     A5 ZZ
          SEC            ;index to next element to be moved  38
          LDX    M4      ;left (down in memory) to new       A6 ZZ
PELI:     BEQ    PIOUT   ;position by subtracting i * j      F0 06
          SBC    M6      ;                                   E5 ZZ
          DEX            ;                                   CA
          JMP    PELI    ;                                   4C YY YY
PIOUT:    CLC            ;and by adding n * j                18
          LDX    M6      ;                                   A6 ZZ
PELN:     BEQ    PNOUT   ;                                   F0 06
          ADC    M3      ;                                   65 ZZ
          DEX            ;                                   CA
          JMP    PELN    ;                                   4C YY YY
PNOUT:    STA    M7      ;to get k.                          85 ZZ
          INC    M8      ;next l (destination of move).      E6 ZZ
          TAY            ;store element to be moved down     A8
          LDA    (M0),Y  ;temporarily in X.                  B1 ZZ
          TAX            ;                                   AA
ROTR:     DEY            ;shift elements l to k-1 right      88
          LDA    (M0),Y  ;into l+1 to k.                     B1 ZZ
          INY            ;                                   C8
          STA    (M0),Y  ;                                   91 ZZ
          DEY            ;                                   88
          CPY    M8      ;                                   C4 ZZ
          BNE    ROTR    ;                                   D0 F5
          TXA            ;put left moved element into        8A
          STA    (M0),Y  ;its new place at l.                91 ZZ
          LDX    M2      ;repeat for elements in present     A6 ZZ
          DEX            ;column until j = m - 1.            CA
          CPX    M6      ;                                   E4 ZZ
          BNE    NEWEL   ;                                   D0 C9
          LDX    M3      ;repeat for columns until           A6 ZZ
          DEX            ;i = n - 2.                         CA
          DEX            ;                                   CA
          CPX    M4      ;                                   E4 ZZ
          BNE    NEWCOL  ;                                   D0 B2
          PLA            ;restore registers.                 68
          TAX            ;                                   AA
          PLA            ;                                   68
          TAY            ;                                   A8
          PLA            ;                                   68
          PLP            ;                                   28
          RTS            ;                                   60
```

UNSPECIFIED OP CODES

For a full report on unspecified 8085 instructions (Sub Sets for February and June 83) both Steven Moore of East Sheen and M J Colley of the University of Essex refer us to an article, published in *Electronics* of 18 January, 1979, which was reprinted in Dr Dobb's *Journal of Computer Calisthenics & Orthodontia*, Number 34.

Steven was told by Intel that the company could not guarantee that these unspecified instructions would work on every 8085 processor.

We also made fleeting reference in February to the unspecified Z80 instructions dealing with separate halves of the IX and IY registers. James Owen of Pt Jeff Sta, New York and Peter Mortimore of London have been a bit more explicit about this. Instructions normally operating on the H register can be used to operate on the high order byte of IX if preceded by DDH or the high order byte of IY if preceded by FDH. Instructions operating on the L register operate on the low order bytes if preceded by DDH or FDH.

RELOCATING Z80 CODE

While presenting this series we have met with some pleasing coincidences. Sometimes two readers from different parts of the country submit, on the same day, routines which do exactly the same job. Sometimes a reader sends in an idea that fits perfectly into another contribution we are writing about at the time.

For example, quite recently, I was about to give a copy of one of my programs to someone I know, when I realised that person didn't have on his machine the high memory locations my program was in. I promised to relocate it for him the next day, intending to reassemble it from source code I had taped some years ago. The source code didn't read in correctly, so I was just about to start the tedious job of copying the program from one area of memory to another and altering all the affected addresses when RELOC, from Tim Watson of Ferndown, dropped through the letter-box. It did the job for me and is printed below.

RELOC uses Bruce Tanner's subroutine, LENGTH (Sub Set March 83), to give the length of each Z80 instruction. It moves the Z80 code in memory and changes jump and call addresses if they are within the memory locations of the code being moved. Also, since 16-bit numbers are usually pointers to memory, the operands of 16-bit load immediate instructions are changed.

The program that was relocated started with a number of text strings, which had to be included in the memory area operated on by RELOC, so that load immediate instruction addresses pointing to the text would be adjusted. None of this text was altered by RELOC, as most ASCII codes do not correspond to op codes that would be followed by addresses. One that could cause trouble is 21H for ASCII exclamation mark and for the op code to LD HL,NN.

DATASHEET

```
;- RELOC - Relocate code in memory.
;/ CLASS:  2 (does not save any registers).
;/ TIME CRITICAL ?:  No
;/ DESCRIPTION:  Moves a block of code from one area of memory
;/                to another, adjusting jump and call addresses
;/                and 16-bit load immediate instruction operands
;/                that fall within the memory locations of the
;/                code being moved.
;/ ACTION:  Move the code to the new area.
;/          Get the length of the 1st. instruction.
;/          If less than 3 bytes then ignore it.
;/          If the length is 3 bytes and the 1st. byte is not
;/          DDH or FDH then do a relocation correction if the
;/          address is in the program range.
;/          If the length is 4 bytes and the 2nd. byte is not
;/          36H or CBH then do a relocation correction of the
;/          address is in the program range.
;/          Get the next instruction and repeat process.
;/ SUBr DEPENDENCE:  LENGTH.
;/ INTERFACES:  None.
;/ INPUT:  BC points to the start address of the code to be moved.
;/         HL points to the last byte of the code to be moved.
;/         DE points to the new start address.
;/ OUTPUT:  The relocated code.
;/ REGs USED:  All.
;/ STACK USE:  8
;/ LENGTH:  119
;/ PROCESSOR:  Z80

RELOC:    PUSH  DE          ;store new start                  D5
          POP   IY          ;address in IY and                FD E1
          PUSH  DE          ;save for later use.              D5
          OR    A           ;clear carry flag.                B7
          SBC   HL,BC       ;gives no. of bytes of code-1.    ED 42
          PUSH  HL          ;swap                             E5
          PUSH  BC          ;HL                               C5
          POP   HL          ;and                              E1
          POP   BC          ;BC.                              C1
          INC   BC          ;gives no. of bytes to move.      03
          LDIR              ;move the code.                   ED B0
          OR    A           ;clear carry flag.                B7
          PUSH  DE          ;save new end address + 1.        D5
          EX    DE,HL       ;get end address + 1 in HL        EB
          SBC   HL,DE       ;work out displacement of code.   ED 52
          LD    B,H         ;save displacement                44
          LD    C,L         ;in BC.                           4D
          POP   DE          ;restore new end address + 1.     D1
          EXX               ;save DE and HL for later.        D9
          POPP  HL          ;get new start address.           E1
LOOP:     PUSH  HL          ;save pointer to next op code,    E5
          PUSH  HL          ;twice.                           E5
          CALL  LENGTH      ;get length of instruction.       CD ZZ ZZ
          POP   HL          ;restore pointer to op code.      E1
          LD    A,E         ;get instruction length into A.   7B
          PUSH  DE          ;save instruction length.         D5
          CP    +3          ;3-byte instruction?              FE 03
          JR    C,INCPTR    ;jump if 1 or 2 byte instr.       38 43
          LD    A,(HL)      ;get 1st. byte of instruction.    7E
          JR    Z,BYTE3     ;jump if it is 3-byte.            28 10
          INC   HL          ;point to second byte.            23
          CP    0EDH        ;1st byte EDH?                    FE ED
          JR    Z,DOLOC     ;if so, do relocate.              28 13
          LD    A,(HL)      ;get 2nd. byte.                   7E
          CP    0CBH        ;is 2nd. byte CBH?                FE CB
          JR    Z,INCPTR    ;if so, jump to ignore.           28 36
          CP    36H         ;is 2nd. byte 36H?                FE 36
          JR    Z,INCPTR    if so, jump to ignore.            28 32
          JR    DOLOC       ;otherwise do relocate.           18 08
BYTE3:    CP    0DDH        ;is it an IX instruction?         FE DD
          JR    Z,INCPTR    ;if so, jump to ignore.           28 2C
          CP    0FDH        ;is it an IY instruction?         FE FD
          JR    Z,INCPTR    ;if so, jump to ignore.           28 28
DOLOC:    INC   HL          ;point to lower address byte.     23
          LD    C,(HL)      ;put byte in C.                   4E
          INC   HL          ;point to higher byte.            23
          LD    B,(HL)      ;put it in B.                     46
          PUSH  BC          ;put address into                 C5
          POP   IX          ;IX register.                     DD E1
          EXX               ;now need displacement.           D9
          ADD   IX,BC       ;work out new address.            DD 09
          EXX               ;save displacement again.         D9
```

```
          PUSH  IX          ;address into                     DD E5
          POP   BC          ;BC.                              C1
          PUSH  HL          ;save where to put BC.            E5
          PUSH  IY          ;new start address                FD E5
          POP   HL          ;into HL.                         E1
          OR    A           ;clear carry flag.                B7
          SBC   HL,BC       ;check if BC ≥ HL.                ED 42
          POP   HL          ;get back where to put BC.        E1
          JR    Z,EQST      ;jump if BC=new start address.    28 02
          JR    NC,INCPTR   ;jump if BC out of range.         30 0E
EQST:     PUSH  HL          ;save HL.                         E5
          PUSH  BC          ;save BC.                         C5
          EXX               ;get new end address + 1.         D9
          POP   HL          ;address into HL.                 E1
          OR    A           ;clear carry flag.                B7
          SBC   HL,DE       ;check if BC ≤ HL.                ED 52
          EXX               ;save new end address;            D9
          POP   HL          ;get where to put BC.             E1
          JR    NC,INCPTR   ;jump if BC out of range.         30 03
          LD    (HL),B      ;put higher byte in memory.       70
          DEC   HL          ;point to lower byte position.    2B
          LD    (HL),C      ;put lower byte in memory.        71
INCPTR:   POP   DE          ;get length of instruction.       D1
          POP   HL          ;get address of the instructn.    E1
INC:      INC   HL          ;point to next position.          23
          DEC   E           ;counter = counter - 1.           1D
          JR    NZ,INC      ;jump if HL not at op code.       20 FC
          PUSH  HL          ;save position of next op code.   E5
          EXX               ;get new end address + 1.         D9
          POP   HL          ;get address of next op code.     E1
          OR    A           ;clear carry flag.                B7
          SBC   HL,DE       ;compare with new end addr+1.     ED 52
          EXX               ;save new end address + 1.        D9
          JR    C,LOOP      ;jump if another instruction.     38 A2
          RET               ;done.                            C9
```

ELEGANT SOLUTION INVITED

In this problem, the target byte holds information which determines how four graphics dots are to be displayed as either background (not showing) or as one of three colours. This dot information is held in the least significant 2 bits of a byte, which represent the four states 00, 01, 10 and 11 with the six most significant bits of the byte reset. The information for the dots, which are numbered 0 to 3, is arranged in the target byte thus:

bit	7	6	5	4	3	2	1	0
dot	0	1	2	3	0	1	2	3

Dot 0 information is in bits 7 and 3 of the byte, dot 1 in bits 6 and 2, dot 2 in bits 5 and 1 and dot 3 in bits 4 and 0.

Given a 2-byte address of the target byte, a 1-byte dot number (binary 0 to 3) and 1 byte of dot information (wherever you like in either registers, memory, or as parameters embedded in the code following the subroutine call), we want the most elegant routine to place the dot information, according to dot number, in the target byte, without disturbing any of the information relating to the other three dots.

Those of you with the right hardware will recognise the format of the target byte as that used in display modes 1 and 5 of the BBC Micro. So solutions in 6502 code will be particularly relevant, though solutions in other code will be interesting

STACK EXCHANGES

Another challenge made in June was for an 'EX (SP),BC'. Robert Whisson of Cheam has risen to it and sent in the following exchanges for the Z80 (5 bytes, 78 T states), 6502 (18 bytes, 40 T states) and 6809 (12 bytes, 34 T states) showing just how powerful the Z80 instruction EX (SP),HL is.

DATASHEET

```
EXSPBC:   EX    (SP),HL   ;                               E3
          PUSH  BC        ;                               C5
          EX    (SP),HL   ;                               E3
          POP   BC        ;                               C1
          EX    (SP),HL   ;                               E3

EXSX      PHA             ;save A and X on stack          48
          TXA             ;                               8A
          PHA             ;                               48
          TSX             ;index stack                    BA
          LDA   $0103,X   ;get exchange byte              BD 03 01
          PHA             ;to top of stack                48
          LDA   $0101,X   ;get stacked X                  BD 01 01
          STA   $0103,X   ;in its place                   9D 03 01
          PLA             ;exchange byte into X           68
          TAX             ;                               AA
          PLA             ;discard old X                  68
          PLA             ;restore A.                     68

EXGSX     PSHS  X         ;X temporarily on S             34 10
          LDX   2,S       ;get exchange word              AE 62
          PSHU  X         ;temporarily on U               36 10
          PULS  X         ;get X and put in place         35 10
          STX   0,S       ;of exchange word               AF 60
          PULU  X         ;get exchange word into X,      37 10
```

COMMUNICATIONS

PCW welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software — these questions must be addressed to Peter Bright (see 'Computer Answers' page). Address letters to 'Communications,' Personal Computer World, 62 Oxford Street, London W1A 2HG.

Cause and effect

Martin Banks' reply to Martin Perry's letter on the subject of video games deserves comment.

Martin Banks insinuates that video games encourage aggression. They do not. Aggression, or the desire to be best, encourages video games. If there was no aggression in humans, then video games would never have sold. If humans did not want to prove that they were better than each other, then there would be no video games.

Video games are, in essence, no different to any other game. Monopoly, pinball, football, chess, missile command: all contain elements of aggression, and all are designed to increase self esteem.

If a game can ameliorate aggression in humans, then it is better done in that context than against society.

Steve Rewey, Reading, Berks

(*. . . an effect can become a cause, reinforcing the original cause and producing the same effect in an intensified form and so on indefinitely. A man may take to drink because he feels himself a failure, and then fail all the more completely because he drinks.* George Orwell, Politics and the English Language — *Ed.)*

Pricey ACT

R M Richards (*PCW* September) has barely begun to plumb the depths of ACT's mendacity. Given time, he will discover that the single most necessary piece of equipment for a Sirius owner is a very large bank balance.

He may, for example, wish to make use of the multiple character sets, and the facility for designing customised character sets, which play such a prominent role in ACT's publicity material. If so, then he'll need extra programs costing £195.

He may, like us, have been attracted by the promise of a 132-column display, which has obvious applications in spreadsheet and similar work. Unfortunately, this uses so much memory that it cannot be run at the same time as a spreadsheet or wordprocessing program. The solution is a memory expansion — cost: about £400.

But perhaps his needs are more modest: he may, for example, simply want to use the built-in, 18-key calculator keypad which adorns the Sirius. Unfortunately, money will not help him in this case: the calculator function simply *doesn't work*, and it cannot be made to work for love or money! ACT admits this; but it has no plans to do anything about it. So he'll just have to make do with a pocket calculator, which he should be able to pick up for a fiver or so.

Of course, all the keys on the Sirius keyboard are user-programmable; so he may wish to re-program the useless calculator keys for other purposes. To do this, he will need a programmer's toolkit costing £195.

Dermod Quirke,
Strangled Vole Press, London

Acorn dealing

Following the 'Closed Shop' item in September's 'Newsprint', *PCW* readers may be interested in an occurrence witnessed at the recent 'Micro User' Show in Manchester. It was seen by a number of visitors, although they may not have realised what was going on. It concerns Acorn, Dealer A (a well-respected, but unofficial dealer) and Dealer B (an 'official' and also well-respected firm).

On the final afternoon, Dealer A, who had been selling Model Bs throughout, decided to offer a £10 discount, to get rid of remaining stocks. When news of this reached the Acorn stand, one of their sales team went across and demanded that Dealer A restore the 'proper' price, and also wanted to know where the machines had been obtained from. Getting short shrift on both counts, Acorn approached Dealer B and told them to undercut Dealer A's price, with Acorn making up the difference. In due course, a mini-skirted young lady stationed herself on the edge of A's stand, with a billboard announcing that B's prices were cheaper! Not unnaturally, A took exception to this and made it clear to the young lady, who was unaware what she had let herself in for and removed herself, to return later with a couple of 'minders'! At this point, the thing broke out into a public slanging match between Acorn and Dealer A, and continued until the Show closed. The episode is doubly interesting, because Acorn publicly says that they are not opposed to discounting.

In 'Communications', you printed a letter from John Cooper (September *PCW*) about his difficulties getting Atom information from Acorn. I'm not surprised. The Atom was 'killed off' by Acorn last February, when all production ceased. Mind you, you will have a hard time getting Acorn to admit it. Atoms are now being heavily discounted by dealers (£100 or less) and represent a real bargain. Even though it's three and a half years old, it's still a nice machine and it would have been better if Acorn had dropped the price — which it certainly could have afforded to do. Had the company done so, I'm sure that it would have found a ready market. How heartily I agree with Clive Wallers' letter in the same issue — the Atom is a good example! Users who are thinking of selling off their Atoms should think again. Get a new machine, by all means, but as well as — not instead of — the one you've got. In the meantime, don't expect too much sympathy from Acorn. The *real* support will come from user groups and from dedicated magazines.

Barry Pickles, Manchester

PS. Did you ever get a reply from Acorn to Guy Kewney's open letter?

(Yes, Chris Curry said he was attending to the matter — Ed.)

Strange humer

I am writing on behalf of my client — Marcol Trading of Southampton — with reference to the comments on our Home Computer and Video Cabinet as featured by Mr Guy Kewney in your September issue (Newsprint).

While we greatly appreciate the value of editorial in a publication such as yours, and while also accepting the fact that the review was intended to be 'humerous' I feel I must draw your esteemed attention to its misleading approach.

In the first instance, it was not at all clear whether the illustration referred to the Marcol Cabinet or the Abacus Micro Tidy. We received several telephone calls from readers who were obviously misled by the reference to a 'drinks cabinet' as a description of a well designed Computer and Video Cabinet custom made after the most extensive consultation with a great number of PC users.

Jean Wiseman,
A & J Publicity, Edgware, Middlesex

(Very 'humerous' — Ed.)

Basic challenge

While browsing through your readers' letters column 'Communications', in the September issue of *PCW*, I came across a letter from R G Silson of Herts who gave a sample of a short Basic routine (which he uses as the main body of most of his own programs), and challenged Pascal programmers to write it more efficiently.

My first reaction was to grunt and go on to the next letter, but I then realised that Mr Silson was putting forward a reasonable argument. Why not try to answer it?

I have been writing in Pascal for several years now and consider myself (at the risk of seeming big-headed) rather good at it, although I did not even attempt to rise to the challenge set.

And why not if Pascal is so wonderful and I'm so good?

The main reason is that I could not for the life of me make head nor tail of the Basic routine that was provided — I simply found the example chosen to be totally unreadable to me, except that I understood its purpose was to control the logical flow of a program (and that only because of the accompanying letter). This is not because I am ignorant of Basic. I programmed for several years in Basic before turning at last to Pascal. It seemed to me from the arguments put forward in his letter that Mr Silson was missing the point of languages like Pascal entirely.

A structured program (believe it or not), is *not* the object of the exercise when writing in Pascal. Structured programming is a recipe for an end product which has more measurable benefits — the most obvious of which is readability by anyone accustomed to Pascal. I would be very interested to find out what percentage of even the most hardened Basic programmers were able to understand what Mr Silson's routine was doing.

Next point is the amount of dependence that a particular routine has on a host program. I counted a total of 13 variables used in the Basic example — all of which are available to the whole of any program in which this routine is incorporated. This, to my mind, is a recipe for disaster since even a small bug in a large program could have terrible consequences if it affected the value of any of these variables. In Pascal it is possible to declare what are called *local* variables — ie, variables that can only be affected by the routine which creates them. This makes bugs of the type I have just described (along with a host of other similar catastrophes), virtually impossible in a well structured program.

Next comes the discussion of compactness and its effect on program execution speed. This argument is not really relevant to Pascal and other compiled languages since the readable text of the program (called the 'source'), is not what is actually run by the computer. Pascal progams are normally 'compiled' into machine language before being run. This means that no matter how wordy the source is (within reason), the program will still go like a rabbit with its tail on fire, after all, machine code is machine code whether from a compiler or written by hand. This means that Pascal programs can be made as wordy (or readable) as you like and you *still* get the benefits of compact code, a thing impossible to achieve with interpreted languages like Basic.

I would be willing to bet that if Mr Silson could explain to me what his routine is doing I could write it in a more 'wordy' way as he puts it, and still be confident that it will run many times faster than his Basic equivalent. He could of course improve his speed by rewriting his routine in machine language — but this only helps to prove that Basic is inadequate for his needs.

None of this means that I would do away with Basic altogether, since it is quite useful for short programs where execution speed and maintainability is not of the essence. It could also be useful for testing the logic of complicated algorithms before writing and compiling in Pascal — the interactive nature of most Basic systems has many advantages here. As an introduction to newcomers to the art of programming it is also quite good, a point where my personal opinion differs from many Pascal buffs.

However, when writing code for large or serious projects there is really no competition between Pascal and Basic — only between Pascal and other similar languages. There is a good reason why almost no 'professional' software companies use Basic after all.

Finally, I would like to encourage everybody to have a go at Pascal. Buy a compiler if you can afford it (you can even get them for the Spectrum and other home computers now), or simply learn the language if you can't. I would be more inclined to listen to arguments against Pascal from someone familiar with the language than someone who has only heard tales about it. But either way it can improve your programming skills enormously — opening wide new areas of understanding about computers (even if you stick to Basic in the end).

Don Milne,
Aberdeen, Scotland

Family fun

I felt I had to write to you to let you know how much our family enjoyed the Cross Figures puzzle and article in *PCW* (June issue). My son showed us the article and as a family we had much fun in competing to work the puzzles out. They are intriguing and certainly get the 'grey matter' working. I do hope this will continue as a feature.

B Butcher (Mrs),
Holmer Green, Bucks

No support

Perhaps one of the female members of staff should have reviewed the Pied Piper, if it really offers 'bust extension' facilities?

Steve Graham, Belfast

(Who needs em? — Ed.)

Logical argument

I would like to suggest that Dick Olney ('Lesson in Logo' June '83 issue) take a restraint. He is, of course, entitled to his opinion that 'formal logic is about as useful in real human decision as differential equations, and has little or no applicability outside the academic environment'. This was his view of the usefulness (or lack thereof) of the logic programming language Prolog.

I suggest that Mr Olney show restraint in expressing his views until he has a better understanding of the topic in question, and until he has more facts which relate to the topic.

The fact that Prolog is based on formal logic gives no hint at the important consequences of that fact. Furthermore, its usefulness goes way beyond the formal expression of logical statements. A digital computer is useful for things other than manipulating sequences of 0's and 1's, even though that is all it actually does at the lowest level.

Prolog has a very healthy existence outside academia — in fact my company depends totally upon it. Many 'real world' organisations (including multi-nationals) are adopting Prolog for serious use, and, of course, the Japanese are using it as the basis for the 'kernel' language of their Fifth Generation Computer Systems.

One last point: I think Mr Olney's article did not give Prof Bob Kowalski enough credit or respect. This is the person whose insight recognised that logic could be used as a programming language — a key figure in the pioneering work of Prolog. He is very well respected by all people concerned with AI, both in academia and in industry and government.

Restraint, please, Mr Olney.

Alex Goodall,
Expert Systems, Oxford

NewBrain caution

I recently spent £21 on two programs for my NewBrain, from a firm called Microplot which advertises regularly in *PCW*. A quick trial of the programs on arrival revealed several serious limitations which were not even hinted at in the original advertisements. I send the cassette straight back with a letter of explanation, assuming that my money would be refunded without question. I was therefore somewhat put out to receive a bluntly-worded reply rejecting my criticisms out of hand and offering to refund only 50% of the original charge.

The NewBrain is an

excellent, if underrated, computer, and it is encouraging that software for it is beginning to appear on the market. However, most of this software has to be bought on trust, as advertisements rarely describe programs in detail and NewBrain software is not usually reviewed in computer magazines. In this situation, is it not reasonable to ask for a full refund of the cost of a program which proves unsuitable for a particular user's needs? I suggest that NewBrain users, and others, should be very cautious about buying increasingly expensive software on the basis of brief advertisements by firms which do not offer refunds.
John B Allen, Edinburgh

(I advise even more caution given the uncertainty that now surrounds the NewBrain — Ed.)

Software standards

As an untrained programmer, the article on CTUK! programming standards (September *PCW*) was very interesting. I agree with much of the CTUK! test, yet the emphasis appears wrong.

Take two examples. A professional programmer writes a program which can calculate the day of the week for any day back to the year 1700. It is well coded, makes nice use of arrays and is visually well presented and thoroughly user-friendly. It might score almost 100%, and yet be of minimal interest apart from an elementary demonstration showing the power of a computer. We've all seen these programs in magazines, but who is going to type them in?

On the other hand old Joe, who has been working in farms and gardens all his life, buys a computer for his retirement. He writes a program. What happens is you tell the computer about the weather and the time of year . . . The computer blanks out and after what seems an interminable ten seconds
PLANTTATERS
FUTRYLISE THE R
UNNERS
appears on the screen. This program could be very useful to many people. But it will probably only score points for 'novel visual effects'!

As the computer world grows there will always be a place for the correct, systematic but not very imaginative programmer; but there will also be a place for the innovative, imaginative but undisciplined one.

I am never very happy about the insistence on planning. Some programmers will work better with flowcharts; they should use them. Some programs need an overall plan before starting. Other programs grow from an idea; if they had to be planned from start to finish they would never have been started. If the user will need to make alterations, it is important to have a readable, moduled program; but this is by no means always the case.

Too little account has been taken of the differing styles and qualities required by different types of programs and users. For instance 'good sound effects' may be essential in an arcade game, desirable in an adventure, irrelevant in a statistical calculation and positively harmful in an accountancy program. There are also the questions of whether the program is in listed form or on cassette or disk, whether the program is protected or not, whether the user will be expected to make alterations, and whether the program is written with the intention of easy conversion to another computer.

I am all in favour of any use of the computer that improves the program, but the use of 'esoteric features to the greatest possible extent' may not do this. I have certainly known programs that I have felt were spoiled by the author's insistence on sound effects, and others where irrelevant graphics have just wasted time and temper. The user isn't interested in whether the author understands the command HGR unless it is important to the program.

In case all this sounds as if I am in favour of sloppy programming, let me say, at the risk of sounding over-critical that there are at least four improvements in the one-liner example given in Section 2a that I would consider desirable in any circulated program of my own:

1 The Screen Prompt is totally ungrammatical. ENTER or TYPE IN is needed.
2 Many users would understand WHOLE NUMBER but not INTEGER.
3 BETWEEN 5 & 10 is ambiguous. Are 5 and 10 allowed?
4 GET Z: IF Z=1 THEN Z=10, etc, is possible. You said it in 5a, — not me!

It is now time to put my own head on the chopping block. I have not attempted any mark scheme, but have simply written down eight questions which should be asked when assessing any program. They may be more searching than they look at first sight.

1 Does it work under any reasonable input by the user? This will test for error traps and special cases; but it also allows the assessor to judge what is or is not a reasonable input from the expected user.
2 Does it serve its intended purpose? Not only does this imply that a program to solve quadratic equations must give a solution; but, for example, an arcade game must entertain and hold interest, and a database program must, in the end, save the user time.
3 Is there the right balance of user-friendliness? An educational program for nine-year-olds should have a prompt like 'Don't forget to press RETURN'. This would be an insult in an assembler program. In most programs a crash due to DATA ERROR is a programmer's mistake, but a programmer may well be aware that this could happen in an advanced mathematical program written for people who can deduce for themselves what has gone wrong. Too much user-friendliness can be patronising, irritating, and above all an awful waste of time if the user has to type in the program.
4 Is it sufficiently well written for its purpose? This is a test for speed, economy of coding, readability, presentation and documentation, visual and other effects. But instance a program that works in half a second which need not necessarily be rejected because it could have worked in a tenth of a second!
5 Is it non-trivial? If most reasonably intelligent 13-year-olds who have owned a computer for a year could have written something like the program it is trivial. It rises above the level if some specialist knowledge is needed to write it, some artistic or musical talent is shown, or some interesting or sophisticated programming techniques are used. Even a trivial program can sometimes become non-trivial because it is exceptionally well written and presented.
6 Is the cost/time/effort justified? An expensive cassette or a program that takes hours to type in will only be justified if there is commensurate user satisfaction.
7 Have all the facilities of the particular computer that would enhance the program been used? This seems a better way of looking at this problem.
8 Did the programmer enjoy and/or learn from writing the program?

If the answer to question 8 is 'yes', the program has been a worthwhile effort. This is vitally important to remember. If the answers to questions 1 and 2 are positive, the program is a good one, although not necessarily of great use and certainly not by itself worthy of publication or indeed any type of circulation. In fact, unless nearly all of questions 1 to 7 can be answered positively, it is doubtful whether the program is likely to be of great interest to many but its author. I do not think that one can be too rigorous about this. If one of the questions can be answered very positively, it may be possible to ignore doubts on others. Certainly it may be worth developing the program further so that all the questions can be answered positively.
G T Childs,
Winchcombe, Gloucs

Star turn

I should like to point out a totally wrong statement in Softek's advertisement in your June 1983 issue. In it this states that their Toolkit for the Sinclair is the 'only implementation of TRACE for the ZX Spectrum'. This is patently untrue, as our own ZX Toolkit has TRACE as one of its 11 utilities.
M E Turner,
Sales Director,
Star Dreams, Seaford, Sussex

END

SCREENPLAY

Steve Mann presents his personal selection of games for the Spectrum, Oric and Commodore 64.

Once upon a time, back in those dim and distant days before the advent of the all-singing, all-dancing, colour, sound and hi-res computer, computer games featured simple monochrome block graphics. Sometimes the effects achieved with these were very good — witness the tyrannosaurus in J K Greye's '3D Monster Maze' for the ZX81 — but all too often they were indistinct and hardly lent a professional air to the game they accompanied.

Today we seem to have gone to the other extreme — even machines like the Spectrum, which is hardly designed for high-class graphics — no sprites and relatively low resolution, plus the inhibition of allowing no more than two colours in a single character square — supports some truly innovative games software with excellent graphics (Zzoom from Imagine, and Melbourne House's Terror-Daktil 4-D are cases in point and are reviewed below). But there has to be a trade-off between graphics and the rest of the program: complex graphics use a lot of memory, as can be seen on the BBC, whose high-resolution modes take a full 20k out of the available 32k of user memory. We're in danger of being swamped by pretty pictures, and all too often these serve to camouflage a paucity of original ideas in the program itself. All too often, the user is cajoled into buying by the brilliance of the display; after it has been played a few times the game is then ignored — unless it is run to show off the graphics to a friend, who is so impressed that he or she rushes off to buy a copy and the process is repeated.

It is often the case that the simpler a game is, the more addictive it becomes. Two of my favourites are Imagine's Jumping Jack, which features a few straight lines and a 'stick' figure — hardly complex, but absolutely perfect for this particular game — and Sunshine's Cruising on Broadway, which consists of a simple grid and a few blobs. Nobody is going to stand around gaping in awe at the splendour of the TV display, but both games have stood up well to constant playing over a period of months which, after all, is what the user wants — even if the manufacturer would prefer him to tire quickly and buy something else.

So the moral would seem to be simple — don't be seduced by a wonderful display, but concentrate on the mechanics of the game and try to judge just how well it lasts: will it still be played in three months' time?

For this reason, the 'Addictive quality' rating for games reviewed in this column is probably the most important. It's a purely subjective viewpoint, of course, and some of the games have to be reviewed after less than a week of testing, but this rating is at least an attempt to give an idea of how well a game stands up in the long term. I find the Zzoom graphics truly wonderful and I've been playing the game a lot — but I'll bet that in six months' time there'll have been something that's even better visually and, fickle creature that I am, I'll have forgotten Zzoom entirely — but I'll still be playing Jumping Jack . . .

Anyway, for your delectation and edification this month, here's a selection of games for the Spectrum, Oric and Commodore 64.

ZZOOM

Computer: 48k Spectrum
Supplier: Imagine
Price: £5.50

With Zzoom, Imagine has departed from its usual practice of producing software for both sizes of Spectrum. By developing it for the 48k model, Imagine's programmers and designers — Dave Lawson, Mark Butler and John Gibson — have produced what must be the state of the art in Spectrum graphics. Visually, this game is truly stunning: beautifully smooth movement — sprites? Who needs 'em? — lots of objects onscreen and moving at the same time, and a clear, easy-to-read display of instrumentation.

Imagine does not believe in hiding its light under a bushel. Zzoom comes in an elaborate package several times larger than usual with a somewhat pretentious Latin motto — 'Nomen Ludi' or 'Name of the Game' — and a small instruction book printed on high-quality, cloth-type paper. The packaging certainly leads one to expect something spectacular and, for a change, the product inside is no let-down.

The instructions start with the usual burst of hyperbole — lots of guff about sweat beading your brow, gleaming ground skimmers, etc. There must be a new industry here — I always wanted to be a book-jacket blurb writer, but I think writing background descriptions for computer games must be even more satisfying — anyone out there want a hack with an over-developed talent for exaggeration and no sense of shame? Anyway, get past this and you'll find it easy enough to work out what to do.

A condensed version of the storyline follows: you are at the controls of a ground skimmer (gleaming, sweat beading its brow, etc) and your mission is to protect the dozens (or thousands, if you believe the instructions) of refugees from an enemy bent on genocide. The skimmer can move up, down, left and right and is equipped with machine-guns and air-to-air and air-to-sea missiles. The TV screen shows the view from the cockpit, and also features a small radar screen and other instrumentation to show you the state of play. There is a wide choice of control keys so the user can select ones with which he/she feels comfortable, and there is a 'freeze' facility to halt the program.

The game starts with a menu to allow selection of keyboard or various joysticks (Fuller, Kempston, Protek, AGF). The first stage of the game has the skimmer trying to destroy aircraft and Exotron missiles. The skimmer's missiles do not operate in this phase; you are reliant on your machine-guns. The refugees trot around, throwing up their arms in a most satisfactory manner (it's amusing to shoot them yourself occasionally, just for the hell of it) and the magenta planes and swastika-shaped Exotron missiles wheel and swoop very convincingly. After this, the action moves to a desert location with avenues of palm trees and squadrons of tanks bearing down on you. Your missiles are activated for this and subsequent stages. Get through the desert and you'll find yourself all at sea, with your refugees in rowing boats (it's fun sinking these, too) and the enemy appearing suddenly in little green submarines. Subsequent screens feature a combination of these, so you will have the desert and tanks combined with aircraft, for example. A particularly difficult foe is the helicopter — tiny copters hover at low levels, wiping out refugees and proving very difficult to hit.

There appears to be no real ending to this game — you simply keep blasting planes, missiles, tanks, submarines, helicopters *et al* until you have used up all your lives — and it must be admitted that the actual mechanics of the game get pretty boring after a while. But the graphics are so good that I find myself returning to Zzoom time and time again just for its visual impact. Take a look — you'll be amazed that such stunning effects can be achieved on the Spectrum. Another winner for Imagine.

PRESENTATION
USE OF GRAPHICS
ADDICTIVE QUALITY
VALUE FOR MONEY

DICTATOR

Computer: 48k Spectrum
Supplier: dk'tronics
Price: £5.95

Computer games can be invaluable in developing character traits. A glance at the more popular software shows that computer users are encouraged to destroy alien beings instantly, with no attempt at communication; to enter into research into the supernatural by swallowing pills and eating ghosts; and to investigate creatures of myth and legend by playing adventure games which inveigle the player into wandering through strange landscapes killing trolls, dragons, elves, etc. One of my favourite ZX81 games, Dictator, was designed to instill qualities of leadership — the player took the role of President of a banana republic and showed care and compassion for his not-so-loyal subjects by running the economy into the ground, siphoning off as much of the pitifully small money supply as possible, fomenting revolution and fleeing to Switzerland. As such, this scenario had the ring of authenticity. The game has now been tarted up with colour and sound and transferred to the 48k Spectrum.

The player is first met with the Ritimban flag and national anthem; pressing any key gets rid of these and the game proper begins. The President is elected for life — which is likely to be short — and his rule is divided into monthly segments. At the start of each month, one of the country's various factions — peasants, landowners, army, etc — is granted an audience and the President has the option of granting or denying the request. Advice is available as to the outcome of the ruler's decision. The strategy of Dictator is dependent on juggling various factors — each faction is given a rating for strength and for support of the President, and these fluctuate according to the Presidential decisions. At the end of each month, the President has five choices — to please one group, please all groups, boost his own interests, strengthen a group or raise cash. At all times — except for the first two months — an assassination attempt or revolution may occur, while at random intervals a newsflash brings grim tidings: the failure of the banana crop, an explosion at the army's single barracks (or should that be 'barrack'?), etc.

The attitude and strength of the neighbouring country, Leftoto, must be taken into consideration and of course there is a guerrilla group that exists solely to bring an end to the Presidential rule — no bargaining or courting popularity with these boys. America or Russia may be tapped for a loan when times get tough, but their reaction to a request for cash depends on their opinion of the President's rule. The Secret Police are hated by all factions but will supply you (at a thousand dollars a time) with a report of your popularity or lack of it and the relative strength of all factions. The President also has a small private army of thugs — his bodyguard. These chaps are not overburdened with intelligence but will fight for you in a revolution. Should you attempt to flee the country, though, they will gun you down without blinking.

The bodyguard provides your strength rating of 4: this is a constant while ratings for other factions fluctuate. When a revolution starts you are supplied with the combined strengths of the factions opposing you and you must ally yourself with another group for the fight. Thus you must make sure that one group remains loyal — the other option is to say 'to hell with the lot of you' and make a run for it. One of the Presidential options is to buy an escape helicopter; this will decrease your popularity with all groups who will quite naturally feel aggrieved that their beloved leader is contemplating doing a runner, and is best done in the first two months when you are safe from revolution or attempted assassination. When the revolution starts the copter will get you to Switzerland, and your money; occasionally, however, it fails to start (Ritimbans make lousy mechanics) — in which case you will be torn apart by the mob.

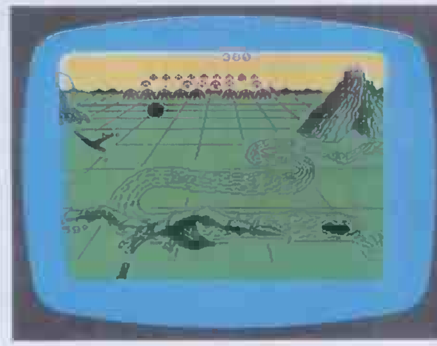
If your popularity with a particular faction drops below 4, that faction will start plotting your downfall. If an ally can be found, revolution will break out — if not, the faction simply tries to kill you.

At the start of your rule, the Treasury holds $1 million, and by judicious borrowing, selling off mining rights, renting of naval bases to foreign powers, etc, it is possible to transfer all of — or even more than — this amount to your Swiss account, despite the fact that day-to-day management of the country depletes the Treasury by $70,000 or more each month.

At the end of each game — when the President is either safely in Switzerland or dead — the score is calculated. The 'Presidential rating' is based on current overall popularity, length of time in office, a bonus for being alive at the end of it, and the amount of stashed cash.

The mark given below for 'Use of graphics' is on the low side: this is because the graphics, while more than adequate in most cases, give a clear indication that the game has been adapted — if Dictator had been designed on the Spectrum I am sure they would play a more prominent role. But this is not a criticism, as the graphics are by no means an important part of the game. I found Dictator compulsive playing — in fact, I think I've found my vocation.

PRESENTATION
USE OF GRAPHICS
ADDICTIVE QUALITY
VALUE FOR MONEY



TERROR-DAKTIL 4-D

Computer: 48k Spectrum
Supplier: Melbourne House
Price: £6.95

Melbourne House has gained a deservedly high reputation for its Spectrum games — The Hobbit and Penetrator. Its latest offering is Terror-Daktil 4-D, which looks set to garner further accolades.

Imagine you are in a clapped-out old aircraft, flying low over volcanoes and jungle in a remote part of South America. The pilot loses control and the plane crashes into a volcano. As the sun comes up, you find yourself on a plateau some distance from the wrecked craft—presumably you were thrown clear in the crash. In the distance you see strange shapes which as they approach reveal themselves to be throwbacks to the age of the dinosaurs — pterodactyls, the terrible 'flying lizards'. Looking around, you spy three rusty old cannon (convenient, eh?). You drag one of these to the plateau and prepare to repel the vicious lizards who are looking for breakfast. Your only hope is to survive for six days and nights, whereupon a rescue plane will reach you.

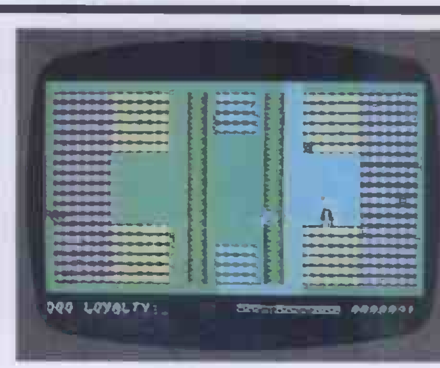
On running the game, you first get a commentary of the events leading up to the crash (this can be omitted if desired). The screen then clears to black and after a short pause the effect of sunrise is simulated with objects gradually becoming clearer. The pterodactyls in the distance resemble nothing so much as a few rows of space invaders, moving across the screen from left to right and vice versa. A figure in the lower left gives the angle of the cannon barrel — ranging from 45 to 72 degrees. The barrel is moved up and down with the Q and A or Z keys, and left or right via I or O and P keys. Any key on the bottom row will fire your weapon. Pressing G and H simultaneously freezes the game and Caps Shift, 1 and Space when pressed at the same time will abort the game. If you ignore the controls for 30 seconds after loading, the program goes into demonstration mode.

Blasting away at the massed ranks scores between 10 and 30 points per hit. Every few seconds one of the creatures peels away from the formation and heads straight for you. This is extremely impressive; the 3D effect is very good and the lizard actually appears quite frightening with mouth agape and teeth gleaming. If you manage to hit one of these in the body your score is augmented by 100. Wave after wave of the things attack you, and all the time the sun is moving (but slowly, oh so slowly) across the sky. This is where the game shows its flaws — I'd love to see what happens after six days and nights, but it takes an age just to get through one day and I simply lose interest after racking up 10,000 points or so. Points are doubled at night, when the display changes to yellow on black and the creatures are much harder to aim at. I've managed to reach day four, but it's just too tiring to concentrate on. The '4-D' of the title refers to time, and I feel that this is where Melbourne House has made a mistake — it takes just that bit too long to sustain interest. The game's author claims that it should be possible to score a million points — I'll take his word for it but I certainly don't plan on trying to find out. Full marks for the graphics, then, but a low addiction factor.

PRESENTATION	■■■■■■■□
USE OF GRAPHICS	■■■■■■■■
ADDICTIVE QUALITY	■■■■□□□□
VALUE FOR MONEY	■■■■■■□□

HOVER BOVVER

Computer: Commodore 64
Supplier: Llamasoft
Price: £7.50



Jeff Minter, the man with a llama fixation, has attracted a cult following over the past year or two with his material for the VIC-20. Gridrunner and its successor Matrix received rave reviews and were generally accepted as being among the hardest games available for home computers.

Now Jeff has come up with a new game — for the Commodore 64 this time — and it's certainly a break with tradition. Instead of the fast and furious action of the 'droid wars, the new game — Hover Bovver — features a much gentler pursuit, lawn-mowing.

Hover Bovver opens with a title screen featuring the familiar llamas and a classy rendition of 'English Country Garden' which shows off the fine sound qualities of the 64. The player takes the part of Gordon Bennett, suburban dweller and keen gardener. It's summertime and the lawn needs mowing — but Gordon's mower is malfunctioning, so it's off to Jim's house to borrow his Air-Mo. Jim is out, but Gordon nips into his garage and 'borrows' the mower. No sooner has Gordon begun mowing the lawn than Jim reappears — and he's not too happy . . .

Gordon's garden is shown onscreen as a plan view, with green areas representing the lawn, and hedges and flower beds providing obstacles. In addition to Gordon's angry neighbour, other hazards are Rover the dog, who hates lawnmowers, and a gardener, who appears when Gordon runs over a flowerbed. Gordon has to avoid the gardener, his irate neighbour and the dog, all the while covering as much of the lawn as possible with his mower. Rover is well trained and will not step on a flowerbed unless Gordon has trampled on it; the gardener also has a respect for the flowers, while the irate neighbour could not care less. Gordon also has to watch for overheating of his mower — if this happens he has to halt and wait for it to cool down. Hedges are used by Gordon as barriers — if he hides behind one, his attackers are stymied.

Gordon has three lives — or, in this case, three neighbours from which to borrow mowers — and each garden gets harder to mow, with less space between flowerbeds and faster-moving attackers. Between each garden is a screen depicting Gordon visiting a neighbour and stealing his mower, which shows off the Commodore sprites to good effect.

This is certainly one of the more original computer games I've seen recently. I was never a devotee of the 'droid wars,' so I can't say how well this compares to Jeff Minter's previous offerings — but I can say that I found it great fun to play and surprisingly difficult at the higher levels. Commodore 64 games software has been somewhat disappointing up to now — this is certainly a step in the right direction. Hover Bovver is for one or two players and uses joysticks.

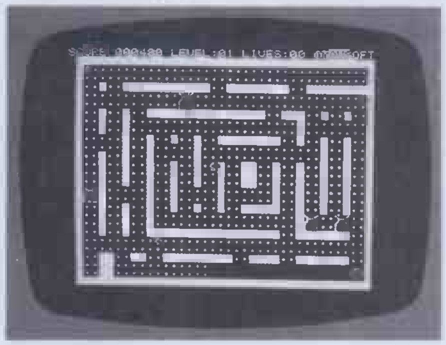
PRESENTATION	■■■■■■□□
USE OF GRAPHICS	■■■■■■□□
ADDICTIVE QUALITY	■■■■■■□□
VALUE FOR MONEY	■■■■■■□□

ORIC MUNCH

Computer: 48k Oric
Supplier: Tansoft
Price: £7.95

Well, well, who'd have thought it? Yes, you guessed — the 'Munch' of the title is a dead giveaway — what we have here is Pacman, very thinly disguised. You control the Oricmuncher and, instead of ghosts, your implacable opponents are 'Bugmonsters'. Otherwise this is pretty much your standard Pacman — the Oricmuncher roams the maze, gobbling up dots and avoiding the Bugmonsters. Eating a flashing dot turns the tables and the Bugmonsters flee in terror as you chase and eat them.

Loading presents no difficulties, even at the fast baud rate — Oric software in general seems to have overcome the problems so prevalent in early games. Once Oric Munch is installed you are given the choice of difficulty levels. Different levels give different scores for eating dots



— it's advisable to start on level one until you get the hang of things; once you are confident of your ability to deal with the faster action you can jump straight in at a higher level.

One of the surprises of Oricmunch is the fact that the mazes have no exits — normally you can get out of a tight spot by dashing for an exit and reappearing on the opposite side. In this game, if you're trapped you're trapped.

The big attraction about Oricmunch is the fact that it's a lot of fun. I have a very simple philosophy concerning Pacman — after an initial flirtation with the game I soon came to the conclusion that if I never saw another Pacman for the rest of my life I'd be more than happy. But I've changed my mind now. Of course, this may be due to the fact that I've ignored Pacman and its derivations for so long that it now appears almost as a new game. I've surprised myself by repeated playings of this version. Oricmunch shows off the Oric's sound and colour to good advantage, and the playing speed is sufficiently variable to make play at higher levels a real challenge. Author G M Phillips deserves credit for taking a very tired and worn-out concept and producing a game that is enjoyable. In fact. this is one of the best pieces of Oric software to appear so far.

PRESENTATION	■■■■■■□□
USE OF GRAPHICS	■■■■■■□□
ADDICTIVE QUALITY	■■■■■■■□
VALUE FOR MONEY	■■■■■■■□

WORK, REST AND PLAY
SUMMER COMPUTER CAMPS FOR KIDS

Maggie Burton has discovered a fulfilling and enjoyable way for children to alleviate the tedium of the long summer holidays.

Amazement and intrigue show on the faces of children operating the BBC Micro

When I was a kid (not so long ago), my parents stuffed me into a coach at Victoria Station and sent me off on a two-week summer camp. Ponies, canoeing, climbing, hiking and sailing were the activities on which I concentrated the next two weeks — oh, and swooning over spotty, canoeing instructors doing Eskimo rolls on the River Wye.

When I came back I was dirty, grazed, suntanned and dead-beat, after two weeks of midnight feasts and all-night giggling in army-style bivouacs.

I think, had I been sent on a two-week computing holiday, some barely-hidden rebellious streak would have turned into a volcano of obstreperous childhoodishness.

Not so is the experience of kids today.

My own story makes the point of this whole article. A mere ten years ago, summer camps were quite a new thing in this country. They're basically an American idea — and a good one, for a variety of reasons. They get the children out of the house during the school holidays (both from under the parents' feet and into a new place to explore), encourage self-reliance, allow children to sample new activities which might incite permanent interest, and they're healthy and good for a child's physical well-being.

So adventure holidays or summer camps have previously been thought of as (for the kids) an exciting outdoor holiday and (for the parents) a good way to have a bit of peace and quiet while farming the kids out to someone else who can teach them new hobbies or sports.

Now, in the last two years, the two best known camp organisers in this country (and some in America, too) have cottoned on to computers.

Dolphin and its competitor Beaumont Camps both operate a similar operation using Public Schools during the holidays. There is very little to choose between the two from the point of view of computing activities.

Both camps intersperse computer tuition with other more conventional camp activities such as pony riding, swimming and canoeing. This is sensible because children are inclined to lose concentration on one activity much faster than adults would.

Curriculum

Children are kept to a strict timetable which is worked out in advance. Generally they take on three or four activities but, if parents specify on application, one or more activities can take precedence over the rest. Thus a child can be sent on an intensive computing holiday, which means it spends more time on computers in proportion to other pastimes.

Both Beaumont and Dolphin recognise the need to separate children of different levels of computing ability. This means that beginners can do beginners' things and some of the experienced children can go into machine code and program structure. To this end there are several groups.

Tuition generally follows the child's experience and ability. The child is moved on to something else as he or she develops.

Children by nature are enquiring, quick to learn and, above all, totally lacking in the kind of barriers adults tend to put up. They also pick up huge amounts of computer knowledge in a phenomenally short time. This goes for both girls and boys — and I strongly emphasise this point.

Beaumont begins to teach programming by taking a group of children step-by-step through one set program. In fact, they all write the same program, but they can alter it and individualise it as they please. This takes the form of a 'hello, I'm a computer, what's your name' program, which makes a great starting point.

From there progress is fairly rapid into arrays, data statements and graphics. Some children don't grasp things as fast as others, of course, but they're not under any pressure.

I must say I noticed a distinct absence of games playing at Mill Hill School, where Beaumont ran a camp this year. And one class of children was learning assembler language, though admittedly most of them had computers at home.

All the Beaumont computers are from Commodore — mainly '64s and VICs. One Commodore 700 lurked guiltily in a corner and a BBC Micro was being used in one of the rooms. Beaumont sells all its equipment at the end of the season at knock-down prices. The system works well. It means the camp gets new and, more likely, trouble-free computers every year.

Mill Hill School camp had a robot arm in one room — a bit like one of those fairground grabbers which always drops

The course instructor ensures everyone has a cassette for their tape recorder

the best prizes. This was being used to pick up Dinky cars, toy bricks and cups under the control of the children.

In addition, Beaumont organises lectures in the evenings. The children don't have to go to these but they are a good extra. Subjects dealt with include Forth, computer applications — ie, what computers are used for — and a lecture on what a computer is made of and how to put one together, using a ZX81 kit as an example.

Dolphin's Ellesmere College is not a lot different from Mill Hill in its general attitude and approach. The computers are Sinclairs on the whole.

Kids begin by experimenting with whatever software they feel like trying out. Of course, a number of games-hungry little tigers leap like Zulus onto copies of space morons and absorb themselves in killing members of other civilisations. But the more serious-minded ones get down to business with Vu-file, Superdraw, Vu-3D and other more useful pieces of software — with the help of their monitors.

After some time allowed to get used to computers (and the Spectrum, in particular), it's time to bite the bullet.

Programming is taught in prepared modules, starting with the essentials and going on to more advanced stuff. These modules are on printed sheets which first of all allow the children to read and learn a bit, and then go on and experiment a little. The children are encouraged to write their own programs or to modify those used as examples.

In one room, a zeaker micromouse zips around a maze under child-control. A BBC Micro, hard-wired as a music synthesiser, will play music composed by the children. A little 'car' races round the room either under computer control or chased by a child pressing buttons on a little control pad. The 'car' is built out of Lego parts, and the kids are encouraged to make their own wacky racers from other bits, using the little driver unit (some sort of digital to analogue converter, a motor and a long interface cable).

A speech synthesiser connected to a Spectrum will say a child's name (or whatever else it is instructed to say). This sounds a little like an American with a nose full of cotton wool talking into a tin can, but it's still talking.

Competitive fervour is dealt with by organising little contests. These encourage kids to go a little further and to stretch themselves a little bit more. So children set to work writing programs to get Zeaker out of its maze in the fastest time, or to create the most realistic image with Vu-3D. Another competition was for the most realistic, coherent sentence on the speech synthesiser. No mean task for a ten or twelve-year-old.

Atmosphere

In both Ellesmere and Mill Hill, the atmosphere was good between monitors and children. A friendship is built up in a short time and the children, as I well know, remember the instructors for a long time afterwards.

All camps run by both Dolphin and Beaumont are headed by a qualified camp director and an assistant. Monitors are generally undergraduates or teachers between jobs. It's a summer job and not many people, in spite of the unemployment figures, are free to work the summer and nothing else for two consecutive years. This means that staff change quickly from year to year.

Instructors in computing are either formally qualified or self-taught enthusiasts. At Ellesmere, the computing leader is a teacher with a lot of self-taught computing knowledge under his belt. At Mill Hill he is an electronics engineer. The knowledge possessed by many of the monitors is evidenced in the writing of software for use by children. At Beaumont an impressive program drew a revolving globe with a BBC Micro. At Ellesmere a program written by one of the monitors enabled the children to use the speech box easily and without needing to come into contact with the nitty-gritty hardware at all. It was a rather neat little user-interface.

Camp food is, as children and monitors alike will testify, notoriously bad. It's like the good old days when school dinners consisted of lead-pellet peas, disgusting rice hedgehogs and sponge pudding which would break your toe if you dropped it. Children on residential camps get three meals a day — breakfast, a packed lunch and dinner.

The kids seem to be well looked after in both establishments. Although there are the inevitable casualties of homesickness and insect bites, everyone has a good time. It's refreshing, educational and a good way for children to spend part of the summer hols.

Day camps, operated mainly by Beaumont, mean younger children can be kept at home for the night and returned to the camp for the day. Coach pickups are provided.

Conclusions

Summer camps, as many parents will agree, are a good idea. If they keep up with new technology at the same time as providing children with new opportunities, they are even better. A week's camp with computing makes a good supplementary introduction to a newly-bought home computer. It also encourages children to believe computers are fun, and there's no better way to teach something than to make it a nice thing to do.

Comments about good ideas have two reservations. Firstly, it's up to the individual child to consider how worthwhile it is to go on a camp. It certainly won't do every child much good and, frankly, the youngest age at which a child is likely to benefit from it would be about six. Four and five-year-olds are just too young. Secondly, summer camps are not for mean parents. It's not extortionate but it is quite expensive — in excess of £100 for a basic

Concentration camp! No hardships here with the robot arm at your disposal

WORK, REST AND PLAY
SUMMER COMPUTER CAMPS FOR KIDS

residential camp with computing, and around £70 for a day camp. Extra doses of things like computing cost more, as does transport (prices are tabulated below for computing camps). This is not overpriced; it's simply quite a costly outfit to run. What you get is in fact not bad at all in value-for-money terms.

Dolphin Camps sent Emma Cypher (aged 11) to Ellesmere School in July for a week. (Her report on her experience there follows.)

Emma's been interested in computers for some time, and has a lively, bright young mind. The picture I saw while I was there was of a kid I know having a whale of a time. She enjoyed every minute of it — and talked nineteen to the dozen about it, too.

On the course that Emma attended there were four times as many boys as girls. This is normal for the residential courses. However, a Dolphin spokesman said that the day camps have a much healthier ratio of girls — around 40%. 'The day camps tend to be socially more up-market and we find that the girls at the day camps are much less likely to have traditional and stereotyped ideas about the female role,' the spokesman said.

For details of next year's camps, write to: Beaumont Summer Camps, 73 Upper Richmond Road, London SW15 2SZ (tel: 01-870 9866), or Dolphin Camps, 68 Churchway, London NW1 1LT (tel: 01-387 5602).

Ellesmere College, Shropshire

Prices

	Beaumont £	Dolphin £
1 week residential camp: depending on location (includes intensive coaching in computing)	108-118	139
1 week day camp	68	59
Plus extra computing (£20 extra)	88	79
Door-to-door pickup (per week)	25	20
Coach transport (per week)	12	12

Discounts are given on all children but one if more than one child is sent.

EMMA'S VACATION

Eleven-year-old Emma Cypher spent a week at Ellesmere College, Shropshire, last August at the invitation of Dolphin/PGL Computer Camp. Here's what she thought of it all.

Last summer I spent a fantastic week's holiday at Ellesmere College in Shropshire. For many, the idea of breaking up from one school to go to another may seem strange but I was to spend the week at the Dolphin/PGL Computer Camp which is held during the holidays. I arrived at the College and went through the reception programme which consisted of formalities like medical requirements, next-of-kin info and (best of all) banking of the week's pocket money. My father had put a 'ceiling' of a pound-a-day on mine, although the Camp's organisers recommend a maximum of £10 per week. (As it turned out my money was ample.)

I was then introduced to my computer instructor who showed us around. We saw the computers lined up with their televisions and various bits of hardware. The majority of computers used are Spectrums although there is a BBC 'B' which is used for music synthesis. There were a number of robots, arms and things, which we were to discover a lot more about over the next few days.

Familiarisation

Steve then showed us to the dormitory high up in the building's attic. There were several dorms, all named after signs of the zodiac — mine was Leo.

Each bed has a large locker at the side with plenty of room for clothes, shoes and toiletries. There were twelve girls in my dorm although not all were on a computer camp holiday. Several were pony trekking and the rest were on multi-activity. In fact there was only one other girl on the same course as me at that time, although another girl arrived later.

After saying goodbye to my parents I joined with the rest of the course, boys included, and we went into the dining hall for tea.

When all the late arrivals had finished tea we all went on a conducted tour of the College grounds. It really is a huge place with a cricket pitch, golf course and rugby and football pitches. As a finale to a busy day we went into the cinema where we saw *Star Trek*.

Timetable

Our day started just before 8am every morning. There were ample washing facilities with a bathroom in the dorm as well as a larger one in the corridor. At about 8.35am we all met at what is known as 'Hyperspace' and went for breakfast. Hyperspace is the name for the computer area.

After breakfast we made our own packed lunches from the food provided and returned them to our dorm for lunch.

At 9.15am we again assembled at Hyperspace and were assigned to our different groups. Each of us, according to age, would have hands-on experience on the computers for part of the day while the remainder was spent on various sporting activities. Each age group was sub-divided into three classes according to the extent of computer experience.

We spent one hour on each of three subjects, which were: 'programming', 'robotics' and 'psychobionics'. The instructors, mainly students taking vacation work, were very helpful and put the information across in understandable words and not in hard-to-follow jargon.

Programming is self-explanatory with about eight Spectrums being used, along with a ZX Printer and cassette player, to show basic programming techniques and skills.

Robotics involved the use of more Spectrums as well as the BBC 'B' micro. A robot arm, a speech synthesiser, a programmable car and a lot of Fisher-Technik building material were used. We were encouraged to use these although no instruction was given on how and why they worked.

Psychobionics was the word used for the computer games and optical illusions.

Variety

Lunch was at1pm and from 2-4.30pm we took part in various sports.

During the week I swam, fenced, abseiled down the side of the College tower, tried to be an archer, and learned some basic judo. After all that activity the evenings were a little quieter.

After tea we had about an hour to ourselves and then we were given our pocket money to spend when the tuck shop opened at 7pm. This sold sweets, soft drinks and souvenirs. Afterwards we were able to swim or take part in some of the organised games like *It's A Knockout*, and were also entertained by the participants of the two Arts & Drama Courses who put on a show for us during the week.

A full day ended at about 9.30pm when we went to bed. We had two midnight feasts on the first and last nights but in between we were too tired to do anything.

I had a very enjoyable holiday at Ellesmere; the instructors were great and very friendly. I met people from other countries and made friends with many of them. In the hope that my Dad will read this, I'd love to go again!!! The trouble is that now, I'm teaching Dad on some parts of programming the Spectrum, and he says he wants to go next year to catch up with me. END

CHECKOUT

MY TALKING COMPUTER

Surya checks out a 'talking computer' from US toy manufacturer, Electroplay, intended for use by children as young as three-years-old.

Designing computers for very young children is an activity fraught with problems. It is, however, a subject to which I would expect a considerable number of companies to turn their attention over the next year or so. With the current emphasis on computers in education, there is a fairly widespread feeling — rightly or wrongly — that any child who does not have a computer at home is going to be disadvantaged at school. Given that the philosophy 'the younger they start, the better' is a common one, the market for a machine which can be used easily by children as young as three should be sizeable.

The problems of designing such a machine are many. Setting up even a humble micro is a fairly involved procedure — certainly not within the capabilities of a three-year-old. The average computer keyboard, with its qwerty layout, is a daunting sight. Written output, however displayed, is not much use to a child just starting to read. Nor would many of today's home computers stand up to the sort of hammering young kids are capable of giving them.

Electroplay, a US toy manufacturer, has attempted to overcome these problems with a machine called — in true American style — 'My Talking Computer'.

Whether it can truly be described as a computer is a debatable point. As 'a general-purpose machine capable of executing a set of pre-programmed instructions' (the usual dictionary definition), the Talking Computer fits the bill, being programmed by slot-in cartridges. By the same token, however, the term 'computer' would cover TV games machines, microwave ovens and an impressive array of washing machines. Anyhow, while this is no doubt the sort of semantic problem that some people find great delight in discussing at length, I'm not going to worry too much about what to call it.

'My Talking Computer' forms an integrated package of hardware and software, and it isn't particularly meaningful to discuss one without the other. For this reason, I will restrict the hardware section to a brief overview before looking at how it functions with the software.

The Talking Computer is a self-contained unit measuring 27x25x7cms comprising: a membrane keyboard, speaker and data socket to hold the plug-in programs. The membrane keyboard itself is not labelled in any way, being instead customised by card overlays supplied with the programs which come in the form of slot-in ROM (Read Only Memory) cartridges. There is no form of interactive visual display, all responses being made via the built-in speech synthesiser.

This is a case where a recording would be worth a thousand words. It's difficult to give any real impression of the quality of the speech through a visual medium such as a magazine. Speech synthesis is still in its infancy and — on micros, at least — has a long way to go before it approaches a life-like voice. Compared to most speech synthesisers that I've heard, however, the Talking Computer is of a very high quality. The manufacturer describes the quality as being 'state of the art' and, while this term suffers much abuse, for a machine costing well under £100 the claim is probably justified.

The voice itself, sad to say, is a heavily-accented American woman who sounds rather like an impatient schoolteacher. This is a great pity since — to my mind — it somewhat defeats the object of using a computer for this type of task.

This is partly a problem of speech synthesis in general. As the quality is still low, it is necessary for the recording on which the synthesis is based to be extremely well enunciated. This inevitably means that the voice will sound forced — particularly if the person making the recording has had to repeat the same words over and over while the technicians try to get a satisfactory recording. These difficulties, however, are of no interest to the child using the machine, and the last thing the child needs is a voice which sounds in any way critical.

At the rear of the machine are sockets for an earphone (supplied, I'm glad to say) and mains adaptor. A slide-off flap underneath the Talking Computer holds five heavy-duty UM1 batteries.

The casing and integral carrying handle is made of a tough, moulded plastic. It gives the impression of being able to stand up to the sort of knocks it is likely to receive in the hands of a three-year-old owner. The whole of the front of the casing to the right of the speaker and data socket lifts to reveal a space in which to store the keyboard overlays.

The software supplied as standard is normally a single program — the 'talking clock'. As an introductory offer to launch the machine in Britain, four other sets of programs are being thrown in free until the end of the year. Further software is being developed and — when ready — will probably sell in the region of £10-£15 per cartridge.

The introductory package consists of four mathematical programs ('Introduction to numbers and maths'), six language and reading development programs ('Introduction to pictures, words and reading'), a 'talking calculator' and four games.

The talking clock overlay takes the form of a clock with movable plastic hour and minute hands. There is an 'on' button, four 'go' buttons (to select the level of difficulty) and a question mark to put the clock into question mode.

Pressing the 'on' button results in the greeting 'hello — now press go'. If you now press any of the four buttons marked 'go', 'My Talking Computer' will tell you to 'set the clock and press the hour and minute hand'. This done, it will tell you the time to which you have set the clock.

The clock may now be used for the child to test him/herself by pressing the button marked with a question mark, or simply to experiment with; the clock confirming the time whenever the hands are pressed.

The software has, what I would describe as, a number of design faults. The first is the fact that, left to its own devices for more than a second or two, the clock will switch itself into question mode. This is taking control of the machine away from the child. The second is that the machine will switch itself off after a very short delay. The child may still be in the process of working out how to set the clock only to find that it doesn't respond when the hands are finally pressed.

Another problem is that the clock relies on a mechanical device to ascertain the positions of the hands. This is by no means infallible: the clock can appear to be set correctly but — because the hands are not quite seated in the correct slot — give a false reading.

The skill level, too, does not adjust to the level of the person using it. It would have been nice if it went back to using whole hours only if a child is consistently experiencing difficulty with more difficult times.

The messages to help a child who has set the clock incorrectly are fair. The Talking Computer will tell the child how to set each hand separately, but — if the child still doesn't manage to set the hands correctly — the machine goes into an endless loop, cycling back through the same correction routine indefinitely.

The mathematical programs are very much of the drill-and-practice variety. Useful in their way, but not over inspiring.

Beginning with recognition of numbers, the set of four programs lead onto simple then more advanced arithmetic, ending with a set of verbal multiplication tables from one to 12.

The 'introduction to pictures, words and reading' comprises six programs, beginning with the process of relating words to pictures and then moving onto simple sentence structure. Each program is again of the drill-and-practice variety. One of them also tells a simple story when the keys are pressed in the correct order, and the final program has a set of 30 words which the child can combine to make up stories of his/her own.

The latter program is the only one in the set which can be used in this open-ended way.

The next program is a 'talking calculator'. The calculator is used in more or less the same way as a normal four-function calculator, except that it uses integers only. Division calculations give an integer answer with a remainder where necessary. A useful introduction to calculators.

The final program set consists of four games which set out to build on the principles covered in the earlier programs — recognition of words, objects, numbers plus an interesting timed game involving addition.

The possibilities opened up by the Talking Computer do contain some dangers. It can be used by very young children without adult help. While this is an advantage in some ways, it also has its drawbacks. The machine could be used to 'keep the kid quiet', replacing much valuable interaction with the parent. Even where very routine tasks are being taught, the contact with the parent or adult forms a valuable part of the 'socialisation process'.

This is to a lesser extent true of any computer system, but the fact that it talks gives it a much greater appeal and makes it accessible to a more vulnerable age range. As with any other piece of technology, it has to be used properly.

'My Talking Computer' is a very nice idea. A self-contained unit requiring almost nothing in the way of setting up, a vocal rather than visual feedback and a graphic keyboard are ideal attractions for the Talking Computer's intended audience.

The software supplied is effective, largely due to the Talking Computer itself — apart from the talking calculator, all are drill-and-practice. This does raise an important point about the machine. While explanations can be given verbally about what to do next, without a screen there is no way to show the user how to do something.

This emphasises the need for extremely well-written software; without it, the Talking Computer is a moderately interesting toy. With high-quality software, this machine opens up many possibilities. Electroplay is interested in working with software houses on developing future cartridges for it; given the design of the machine and the support of a few reputable educational software houses, 'My Talking Computer' could well be a machine to watch.

END

Programs are of drill-and-practice type

Margaret Spooner managed to prise the 'Talking Computer' from Surya's hands long enough to analyse her young children's reaction to 'this new toy'.

Possession of 'My Talking Computer' will confer instant popularity on its proud owner if the experience of five-year-old Meriel is anything to go by. She took it to school and at playtime was the centre of attention as everyone crowded round wanting to have a turn. You'll be pleased to hear that it withstood this onslaught — a fair indication of its robustness.

Having had a brief explanation about how to insert the cartridge in the data socket and the program booklet on the 'keyboard', how to work the talking clock and which words to press to get the computer going, Claire and Meriel were soon happily playing with it.

They chose which programs to use in a totally random way. Such was their excitement at having the chance to try this wonderful toy (no slur intended — this was undoubtedly how the children regarded it) that it would have been useless at first to try imposing on them any type of structured progression through the programs. Anyway they quickly found out for themselves if they had chosen something that was too easy or too hard and moved to another page in the program booklet.

'What I like about this computer is that it waits for you,' was Meriel's first profound observation on the merits of the machine, although at a later stage when she had become more familiar with how to respond, she became somewhat impatient with the measured tones of the voice which did not move on to the next question quite as quickly as she would have liked.

It was fascinating to find her always saying 'Hello' when the computer greeted her, no matter how many times she had heard the greeting before.

Meriel's account of taking the Talking Computer to school included some dramatic mimicry of the teacher's reactions as she touched the keyboard and activated the voice. She also assured me that 'Miss' had looked after the computer at lunchtime. Spies of the future, peering through the staffroom door, revealed that this was so the teachers, too, could try using the machine.

What had they thought of it?

It seems there could be a place for the Talking Computer in the classroom, in particular to help those children who rebel against formal teaching and will not even put pencil to paper. It is the sort of fun machine that could encourage them to learn. It could also provide an enjoyable follow-up to classroom work if suitably structured programs were available (educational software writers should take note.)

In any case a machine with such instant child appeal as 'My Talking Computer' should be quite a success.

PRINT BIG

EPSON MX RANGE ENHANCED

Personalise your stationery and reach new heights with your character sets using Phillip Harvey's machine code printer driver for Z80-based micros.

Have you made full use of your printer's graphics facility? With this article, you can add two extra user-definable character sets to your printer with a choice of three character sizes: normal, twice normal and four times normal size.

Most of the 'MX' range of printers give you the option of double width and condensed print. With both of these, the characters are only expanded, or condensed in the horizontal plane. Characters which can expand in both planes, horizontal as well as vertical, are clearly an advantage because of their more uniform structure (see Fig 1).

With the definable character facility you can produce all sorts of printed sheets very easily and cheaply. To give you an idea of what you can do, here are a few examples: headed notepaper, account sheets, character grids and screen maps, etc. To create different sheets you simply change your text file and/or part of the character tables. Of course, you don't have to just stick to single characters. You can make up pictures and shapes that span as many characters as you require (see Fig 2).

ACTCOD	706B	BCNT	746A	BUFFER	739D	CHPT04	728F	CHPT06	7291		
CHPT10	72B2	CHPT12	72B6	CHPT14	72C9	CHPT16	72CE	CHPT18	72D1		
CHPT19	72D8	CHPT20	72E0	CHPT24	72E5	CHPT30	72EA	CHPT35	72FC		
CHPT40	72FE	CHRCNT	746D	CHRPRT	7287	CNT	7473	CPOSAD	7470		
CR	000D	CRADLF	70F9	CRF25	7110	CRF29	7178	CRF30	7125		
CRF32	7136	CRF33	7148	CRF34	7168	CRF35	7182	CRF36	718F		
CRF37	7192	CRF40	71A5	CRF45	71B6	CRF47	71BC	CRF50	71BD		
CRF89	71B1	DBWTOF	70EC	DBWTON	70E5	DWD	0014	ESC	001B		
FILE01	70AC	FILEND	70AB	FLAG	7475	GETCHR	736B	GM04	70C2		
GM05	70C3	GM08	70C6	GM09	70C7	GM10	70CA	GM20	70D7		
GM21	70D8	GM22	70DB	GRP	0002	GRPMDT	71F2	GRPMOD	70B9		
GTC00	7379	GTC01	737F	GTC02	7380	GTC03	738B	GTC05	738F		
LARTAB	7200	LEF	000A	LEF02	71D7	LEFFED	71C2	LFLTH	7474		
LINPOS	7465	M1D2D1	7354	M1D2D2	735A	M1D2D3	7360	M1D2D4	7366		
M1D2DT	734D	M1D4D2	733F	M1D4D4	7345	M1D4D5	7348	M1D4DT	7338		
MEDTAB	7218	MODE	7467	MPRINT	7019	MPT01	7034	MPT10	7045		
MPT12	7046	MPT20	7051	MPT40	7063	NC1T00	725E	NCHR1T	7258		
NCHR2T	726F	NCHP4T	727F	OUTCHR	70DD	PC1T00	722C	PC1T01	7233		
PC1T08	724C	PC1T10	7252	PCHR1T	7226	PCHR2T	7267	PCHR4T	7277		
PRINT	739A	S1WD	0008	S2WD	0008	SCHR04	71E0	SCHR05	71E9		
SCHR06	71EB	SCHRST	71DA	SET01	7005	SET02	700C	SET04	7016		
SETN1	8000	SETN2	9000	SETPRT	730B	SETUP	7003	SMLTAB	7224		
STP05	7319	STP10	731C	STP15	732B	STR03	7468	STR04	746B		
STR05	746E	STR06	746C	WIDTH	7472						

Control-code call table 'ACTCOD'

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghi
jklmnopqrstuvwxyz*+£.,;:@!"$%&'()=_

ABCEDFGHIJKLMNOPQRSTUVWXYZabcdefghi
jklmnopqrstuvwxyz*+£.,;:@!"$%&'()=_

Fig 1 Difference between standard double width and characters spread in both directions

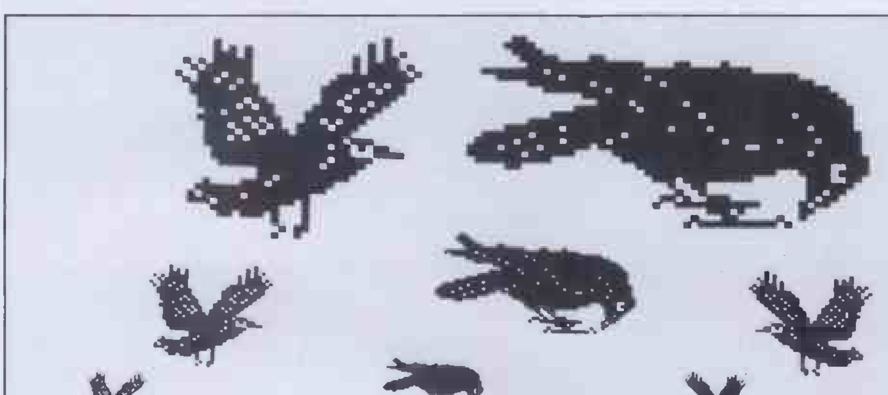


Fig 2 Shapes can be built up from re-designed characters

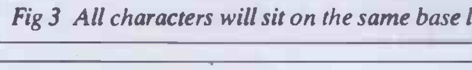


Fig 3 All characters will sit on the same base line

How it works

A line of text is first collected from the main program (such as editor), and stored in a two hundred byte-lons buffer. The next step is to process the line. This entails scanning the line to find the largest letters present (either 1*, 2* or 4*). This information is needed in order that all characters, independent of size, will sit on the same base line (see Fig 3). The actual printing is a very complicated process that would take up far too much space to explain in any depth, but here is a brief outline.

When using the printer's character set, all the characters are sent out as normal. But, with characters from the two extra character sets, the printer's user-definable graphics facility must be used. These extra characters are generated from tables created by the user. Enlarged characters are produced by spreading each 'character dot' over two, or four dots, in both directions.

Connecting up

Before you can start printing, the program's workspace must be set up. To do this, call the routine 'SETUP'. This must be done before the printer is used. In 'SETUP' there is space in the source code for you to initalise your printer if required.

Where your editor used to call your own printer routine, it should now call this program (at its start address). The program is presently positioned at 7000H, but using your assembler, it can be sited anywhere.

Changing character mode

Each character set has its own initiation code. Insert the control code 'GRP' (see listing) followed by the appropriate number, into your text file. The 'GRP' code can be altered to any other code between 00H and 1FH which is not presently used (see the control-code call table 'ACTCOD').

0 — Standard printer character set.
1 — Set one, magnification one.
2 — Set two, magnification one.
3 — Set one, magnification two.
4 — Set two, magnification two.
5 — Set one, magnification four.
6 — Set two, magnification four.

The printer will remain in that mode until another mode is chosen.

Designing characters

Characters can be designed on grids, eight wide by sixteen long. These grids can be produced by your own printer when you start designing your own characters.

When you have drawn your new character on the grid, you now have to convert it into a series of sixteen hex bytes. Each row represents one byte made up of eight bits:

01111100 = 7CH
10000010 = 82H
10000000 = 80H
10000000 = 80H
01111100 = 7CH
00000010 = 02H
00000010 = 02H
10000010 = 82H
01111100 = 7CH
00000000 = 00H
11111111 = FFH
00000000 = 00H
00000000 = 00H
00000000 = 00H
00000000 = 00H
00000000 = 00H

With these sixteen bytes you can now enter them into the table.

Both tables begin with the code 20H, so to find the correct location, use the following equation:

ADDRESS = TABLE ADDRESS + (CHARACTER CODE − 20H)*10H

Example: CHARACTER CODE = 53H ("S")
TABLE ADDRESS = 8000H
ADDRESS = 8000H + (53H−20H)*10H
= 8000H + 33H*10H
= 8000H + 330H
= 8330H

This gives you the address at which to enter your series of sixteen bytes.

END

```
0008
                    INCLUDE B:Z80.L

             ; Enhanced printer routine for MX-80/MX-70 with
             ; user-definable graphics.
             ;
8000         SETN1  EQU 8000H       ; Set number one.
9000         SETN2  EQU 9000H       ;  "     "    two.

             ; Control codes.
0002         GRP    EQU 02H         ; Graphic mode code.
000A         LEF    EQU 0AH         ; Line feed.
000D         CR     EQU 0DH         ; Carriage return.
0014         DWD    EQU 14H         ; Double width on.
001B         ESC    EQU 1BH         ; Escape code.

0008         S1WD   EQU 08          ; Character width for
                                    ; set number one.
0008         S2WD   EQU 08          ; Character width for
                                    ; set number two.

                    ORG 7000H       ; Program start address.
                    LOAD 7000H

7000 C31970         JP MPRINT       ; Input one character.
7003 F5      SETUP  PUSH AF         ; Setup workspace and
7004 E5             PUSH HL         ; printer.
             ;
             ; ENTER CODE IN THIS SPACE
             ; TO SET UP YOUR PRINTER.
             ; HL & AF can be affected.
             ;
7005 AF      SET01  XOR A           ; Set up workspace.
7006 326B74         LD (STR04),A
7009 327574         LD (FLAG),A
700C 219D73  SET02  LD HL,BUFFER    ; Empty buffer.
700F 226574         LD (LINPOS),HL  ;
7012 AF             XOR A           ;
7013 326D74         LD (CHPCNT),A   ;
7016 E1      SET04  POP HL
7017 F1             POP AF
7018 C9             RET             ; Return to main program.

7019 F5      MPRINT PUSH AF         ; SEND FILE TO PRINTER.
701A E5             PUSH HL
701B 2A6574         LD HL,(LINPOS)  ; Position in buffer.
701E 77             LD (HL),A       ; Enter new character
701F 23             INC HL          ; in buffer.
7020 226574         LD (LINPOS),HL
7023 FE0D           CP CR           ; End of line?
7025 280D           JR Z MPT01      ; Yes, jump.
7027 3A6D74         LD A,(CHRCNT)   ; No. of chars. in
702A 3C             INC A           ; buffer.
702B 326D74         LD (CHRCNT),A
702E FEC8           CP 200          ; Buffer overflow?
7030 28DA           JR Z SET02      ; Yes, jump.
7032 18E2           JR SET04        ; Return to program.
7034 D5      MPT01  PUSH DE         ; Now send line to
7035 C5             PUSH BC         ; printer.
7036 DDE5           PUSH IX
7038 DD217574       LD IX,FLAG
703C CDA571         CALL CRF40      ; Check graphic mode.
703F CD2571         CALL CRF30      ; Scan line.
7042 CDC271         CALL LEFFED
7045 EB      MPT10  EX DE,HL
7046 226874  MPT12  LD (STR03),HL
7049 7E             LD A,(HL)
704A FE20           CP 20H          ; Control code or char?
704C 3015           JR NC MPT40     ; Jump, character.
704E 116B70         LD DE,ACTCOD    ; Control code table.
7051 6F      MPT20  LD L,A          ; Index into table.
7052 2600           LD H,0          ;
7054 29             ADD HL,HL       ;
7055 19             ADD HL,DE       ;
7056 5E             LD E,(HL)       ; Get routine address.
7057 23             INC HL          ;
7058 56             LD D,(HL)       ;
7059 EB             EX DE,HL
705A 114570         LD DE,MPT10     ; Store return address.
705D D5             PUSH DE         ;
705E ED5B6874       LD DE,(STR03)
7062 E9             JP (HL)         ; Enter routine.
7063 3A6774  MPT40  LD A,(MODE)
7066 11F271         LD DE,GRPMDT    ; Graphic mode table.
7069 18E6           JR MPT20
                                    ; ACTION CODE TABLE
706B DD70    ACTCOD DW OUTCHR       ; 00H - Not used.
706D DD70           DW OUTCHR       ; 01H -  "    "
```

```
706F B970           DW GRPMOD       ; 02H - (Graphic change)
7071 DD70           DW OUTCHR       ; 03H - Not used.
7073 DD70           DW OUTCHR       ; 04H -  "    "
7075 DD70           DW OUTCHR       ; 05H -  "    "
7077 DD70           DW OUTCHR       ; 06H -  "    "
7079 AB70           DW FILEND       ; 07H - (Stop printing)
707B DD70           DW OUTCHR       ; 08H - Not used.
707D DD70           DW OUTCHR       ; 09H - Not used.
707F DD70           DW OUTCHR       ; 0AH - (Line feed)
7081 DD70           DW OUTCHR       ; 0BH - Not used.
7083 DD70           DW OUTCHR       ; 0CH - (Form feed)
7085 F970           DW CRADLF       ; 0DH - (Return/LF)
7087 E570           DW DBWTON       ; 0EH - (Double width on)
7089 DD70           DW OUTCHR       ; 0FH - Not used.
708B EC70           DW DBWTOF       ; 10H - (Double width off)
708D DD70           DW OUTCHR       ; 11H - Not used.
708F DD70           DW OUTCHR       ; 12H -  "    "
7091 DD70           DW OUTCHR       ; 13H -  "    "
7093 DD70           DW OUTCHR       ; 14H -  "    "
7095 DD70           DW OUTCHR       ; 15H -  "    "
7097 DD70           DW OUTCHP       ; 16H -  "    "
7099 DD70           DW OUTCHR       ; 17H -  "    "
709B DD70           DW OUTCHR       ; 18H -  "    "
709D DD70           DW OUTCHR       ; 19H -  "    "
709F DD70           DW OUTCHR       ; 1AH -  "    "
70A1 DD70           DW OUTCHR       ; 1BH -  "    "
70A3 DD70           DW OUTCHR       ; 1CH -  "    "
70A5 DD70           DW OUTCHR       ; 1DH -  "    "
70A7 DD70           DW OUTCHR       ; 1EH -  "    "
70A9 DD70           DW OUTCHR       ; 1FH -  "    "

70AB F1      FILEND POP AF          ; ABORT PRINTING
70AC DDE1    FILE01 POP IX          ; The control code 07H will
70AE C1             POP BC          ; abort printing for the
70AF D1             POP DE          ; rest of the present line.
70B0 3A6774         LD A,(MODE)
70B3 326B74         LD (STR04),A
70B6 C30C70         JP SET02

70B9 13      GRPMOD INC DE          ; CHANGE GRAPHIC MODE
70BA 1A             LD A,(DE)       ; Each mode is represented
70BB D630           SUB 30H         ; by a number from 0 to 6.
70BD FE07           CP 07
70BF 3802           JR C GM05       ; Jump if valid.
70C1 1B             DEC DE          ; Otherwise reset mode to
70C2 AF      GM04   XOR A           ; 0 - Printer characters.
70C3 326774  GM05   LD (MODE),A
70C6 13      GM08   INC DE
70C7 D5      GM09   PUSH DE         ; Count up number of
70C8 0E00           LD C,0          ; printable characters.
70CA 1A      GM10   LD A,(DE)
70CB FE0D           CP CR
70CD 2808           JR Z GM20
70CF FE20           CP 20H
70D1 3804           JR C GM20
70D3 13             INC DE
70D4 0C             INC C
70D5 18F3           JR GM10
70D7 79      GM20   LD A,C
70D8 326D74  GM21   LD (CHRCNT),A   ; Store value.
70DB D1      GM22   POP DE
70DC C9             RET

             ; OUTPUT CHAR. AT (DE) TO PRINTER.
             ;
70DD 1A      OUTCHR LD A,(DE)
70DE CD9A73         CALL PRINT
70E1 13             INC DE
70E2 C3C770         JP GM09
70E5 DDCB00E6 DBWTON SET 4,(IX+00)  ; DOUBLE WIDTH ON
70E9 C3DD70         JP OUTCHR

70EC 3E14    DBWTOF LD A,DWD        ; DOUBLE WIDTH OFF
70EE CD9A73         CALL PRINT
70F1 13             INC DE
70F2 DDCB00A6       RES 4,(IX+00)
70F6 C3C770         JP GM09

             ; SEND OUT CARRIAGE RETURN/LINE FEED
             ;
70F9 1A      CRADLF LD A,(DE)
70FA CD9A73         CALL PRINT
70FD CDC271         CALL LEFFED
7100 3E0A           LD A,LEF        ; NOTE: Remove if
7102 CD9A73         CALL PRINT      ; line feed automatic.
7105 DDCB0066       BIT 4,(IX+00)
7109 2805           JR Z CRF25
710B 3E0E           LD A,0EH
710D CD9A73         CALL PRINT
```

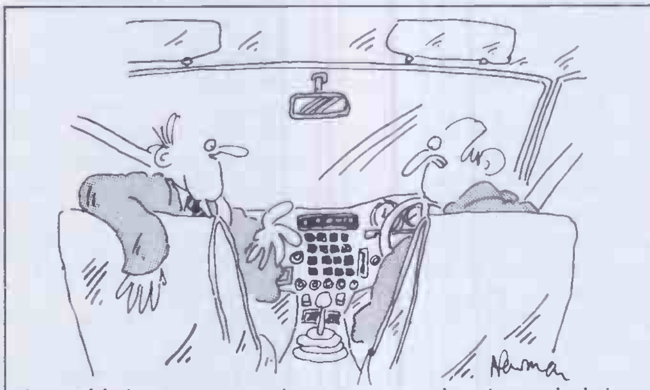
PRINT BIG

```
7110 3A6A74    CRF25  LD A,(BCNT)
7113 3D               DEC A
7114 326A74           LD (BCNT),A
7117 DDCB00CE         SET 1,(IX+00)
711B C2A571           JP NZ CRF40
711E DDCB008E         RES 1,(IX+00)
7122 C3AB70           JP FILEND
7125 DDCB00EE  CRF30  SET 5,(IX+00)    ; Set up small char.
7129 DDCB00B6         RES 6,(IX+00)    ;
712D 3A6774           LD A,(MODE)
7130 326B74           LD (STR04),A
7133 326C74           LD (STR06),A
7136 3A6774    CRF32  LD A,(MODE)      ; Set up character format.
7139 A7               AND A
713A 200C             JR NZ CRF33
713C 3E01             LD A,1
713E 326A74           LD (BCNT),A
7141 3E0C             LD A,12
7143 327474           LD (LFLTH),A
7146 183A             JR CRF35
7148 FE03      CRF33  CP 3
714A 382C             JR C CRF29
714C FE05             CP 5
714E 3818             JR C CRF34
7150 FE07             CP 7
7152 302E             JR NC CRF35
7154 DDCB00AE         RES 5,(IX+00)  ; LARGE
7158 DDCB00F6         SET 6,(IX+00)
715C 3E08             LD A,8
715E 326A74           LD (BCNT),A
7161 3E08             LD A,8
7163 327474           LD (LFLTH),A
7166 183D             JR CRF40
7168 DDCB00AE  CRF34  RES 5,(IX+00)    ; MEDIUM
716C 3E04             LD A,4
716E 326A74           LD (BCNT),A
7171 3E08             LD A,8
7173 327474           LD (LFLTH),A
7176 180A             JR CRF35
7178 3E02      CRF29  LD A,2
717A 326A74           LD (BCNT),A
717D 3E08             LD A,8
717F 327474           LD (LFLTH),A
7182 1A        CRF35  LD A,(DE)
7183 FE0D             CP CR
7185 281E             JR Z CRF40
7187 FE02             CP GRP
7189 2807             JR Z CRF37
718B FE05             CP 05H
718D 2803             JR Z CRF37
718F 13        CRF36  INC DE
7190 18F0             JR CRF35
7192 CDB970    CRF37  CALL GRPMOD
7195 3A6774           LD A,(MODE)
7198 4F               LD C,A
7199 3A6C74           LD A,(STR06)
719C B9               CP C
719D 30F0             JR NC CRF36
719F 79               LD A,C
71A0 326C74           LD (STR06),A
71A3 1891             JR CRF32
71A5 119D73    CRF40  LD DE,BUFFER     ; Scan buffer for mode
71A8 ED536874         LD (STR03),DE    ; change character.
71AC 1A               LD A,(DE)
71AD FE02             CP GRP
71AF 200C             JR NZ CRF50
71B1 CDB970    CRF89  CALL GRPMOD
71B4 1806             JR CRF47
71B6 3A6B74    CRF45  LD A,(STR04)
71B9 326774           LD (MODE),A
71BC C9        CRF47  RET
71BD CDC770    CRF50  CALL GM09
71C0 18F4             JR CRF45

71C2 3E1B      LEFFED LD A,ESC         ; SET LINE FEED LENGTH
71C4 CD9A73           CALL PRINT
71C7 3E41             LD A,"A"
71C9 CD9A73           CALL PRINT
71CC 3A6A74           LD A,(BCNT)
71CF 3D               DEC A
71D0 3E08             LD A,8
71D2 2003             JR NZ LEF02
71D4 3A7474           LD A,(LFLTH)
71D7 C39A73    LEF02  JP PRINT

71DA 3A6D74    SCHRST LD A,(CHRCNT)    ; PRINTER CHARACTERS
71DD A7               AND A
71DE C8               RET Z
71DF 47               LD B,A
71E0 DDCB004E  SCHR04 BIT 1,(IX+00)
71E4 2003             JR NZ SCHR05
71E6 1A               LD A,(DE)
71E7 1802             JR SCHR06
71E9 3E20      SCHR05 LD A,20H
71EB CD9A73    SCHR06 CALL PRINT
71EE 13               INC DE
71EF 10EF             DJNZ SCHR04
71F1 C9               RET
                                       ; GRAPHIC MODE TABLE
71F2 DA71      GRPMDT DW SCHRST        ; 0 - PRINTER SET
71F4 2672             DW PCHR1T        ; 1 - SET ONE *1
71F6 5872             DW NCHR1T        ; 2 - SET TWO *1
71F8 6772             DW PCHR2T        ; 3 - SET ONE *2
71FA 6F72             DW NCHR2T        ; 4 - SET TWO *2
71FC 7772             DW PCHR4T        ; 5 - SET ONE *4
71FE 7F72             DW NCHR4T        ; 6 - SET TWO *4

                      ; RELATIVE POSITION TABLES
7200 FFFFD050  LARTAB DB 0FFH,0FFH,0D0H,050H ; Small
7204 03FFFFFF         DB 003H,0FFH,0FFH,0FFH
7208 FFF0B070         DB 0FFH,0F0H,0B0H,070H ; Medium
720C 3002FFFF         DB 030H,002H,0FFH,0FFH
7210 E0C0A080         DB 0E0H,0C0H,0A0H,080H ; Large
7214 60402000         DB 060H,040H,020H,000H
```

```
7218 F07001FF  MEDTAB DB 0F0H,070H,001H,0FFH ; Small
721C 00000000         DB 000H,000H,000H,000H
7220 C0804000         DB 0C0H,080H,040H,000H ; Medium

7224 8000      SMLTAB DB 080H,000H            ; Small

7226 D5        PCHR1T PUSH DE          ; SET ONE *1
7227 3E08             LD A,S1WD        ; Character width.
7229 110000           LD DE,0
722C 210080    PC1T00 LD HL,SETN1      ; Table start.
722F DDCB0086         RES 0,(IX+00)
7233 226E74    PC1T01 LD (STR05),HL
7236 327274           LD (WIDTH),A
7239 212472           LD HL,SMLTAB
723C DDCB006E         BIT 5,(IX+00)
7240 200A             JR NZ PC1T08
7242 211872           LD HL,MEDTAB
7245 DDCB0076         BIT 6,(IX+00)
7249 2007             JR NZ PC1T10
724B 19               ADD HL,DE
724C 227074    PC1T08 LD (CPOSAD),HL
724F D1               POP DE
7250 1835             JR CHRPRT
7252 210072    PC1T10 LD HL,LARTAB
7255 19               ADD HL,DE
7256 18F4             JR PC1T08

7258 D5        NCHR1T PUSH DE          ; SET TWO *1
7259 110000           LD DE,0
725C 3E03             LD A,S2WD        ; Width.
725E 210090    NC1T00 LD HL,SETN2      ; Start of table.
7261 DDCB00C6         SET 0,(IX+00)
7265 18CC             JR PC1T01

7267 D5        PCHR2T PUSH DE          ; SET ONE *2
7268 110800           LD DE,8
726B 3E10             LD A,S1WD*2
726D 18BD             JR PC1T00

726F D5        NCHR2T PUSH DE          ; SET TWO *2
7270 110800           LD DE,8
7273 3E10             LD A,S2WD*2
7275 18E7             JR NC1T00

7277 D5        PCHR4T PUSH DE          ; SET ONE *4
7278 111000           LD DE,16
727B 3E20             LD A,S1WD*4
727D 18AD             JR PC1T00

727F D5        NCHR4T PUSH DE          ; SET TWO *4
7280 111000           LD DE,16
7283 3E20             LD A,S2WD*4
7285 18D7             JR NC1T00

               ; STANDARD PRINT ROUTINE
               ;
7287 3A6D74    CHRPRT LD A,(CHRCNT)
728A A7               AND A
728B C8               RET Z            ; Return if no more chars.
728C CD0B73           CALL SETPRT
728F 0E01      CHPT04 LD C,1
7291 D5        CHPT06 PUSH DE
7292 1A               LD A,(DE)        ; Next character.
7293 ED5B6E74         LD DE,(STR05)
7297 CD6B73           CALL GETCHR      ; Find in character table.
729A 3A6A74           LD A,(BCNT)
729D 3D               DEC A
729E 5F               LD E,A
729F 1600             LD D,0
72A1 FD2A7074         LD IY,(CPOSAD)
72A5 FD19             ADD IY,DE
72A7 FD7E00           LD A,(IY+00)
72AA 0F               RRCA
72AB 0F               RRCA
72AC 0F               RRCA
72AD 0F               RRCA
72AE E60F             AND 0FH
72B0 2804             JR Z CHPT12
72B2 29        CHPT10 ADD HL,HL
72B3 3D               DEC A
72B4 20FC             JR NZ CHPT10
72B6 3A6774    CHPT12 LD A,(MODE)
72B9 FE05             CP 5
72BB 300C             JR NC CHPT14     ; Jump modes 5 & 6.
72BD FE03             CP 3
72BF 300D             JR NC CHPT16     ; Jump modes 3 & 4.
72C1 3E01             LD A,1           ; Modes 1 & 2.
72C3 327374           LD (CNT),A
72C6 7C               LD A,H
72C7 1808             JR CHPT18
72C9 CD3873    CHPT14 CALL M1D4DT      ; Four times bigger.
72CC 1803             JR CHPT18
72CE CD4D73    CHPT16 CALL M1D2DT      ; Two times bigger.
72D1 5F        CHPT18 LD E,A
72D2 FD7E00           LD A,(IY+00)
72D5 3C               INC A
72D6 2003             JR NZ CHPT19
72D8 5F               LD E,A
72D9 180A             JR CHPT24
72DB 3D        CHPT19 DEC A
72DC E60F             AND 0FH
72DE 2805             JR Z CHPT24
72E0 CB3B      CHPT20 SRL E
72E2 3D               DEC A
72E3 20FB             JR NZ CHPT20
72E5 3A7374    CHPT24 LD A,(CNT)
72E8 47               LD B,A
72E9 7B               LD A,E
72EA CD9A73    CHPT30 CALL PRINT       ; Print one dot column
72ED 10FB             DJNZ CHPT30      ; using the printers
72EF D1               POP DE           ; definable graphic
72F0 0C               INC C            ;          facility.
72F1 79               LD A,C
72F2 DDCB0046         BIT 0,(IX+00)
72F6 2004             JR NZ CHPT35
72F8 FE09             CP S1WD+1
72FA 1802             JR CHPT40
72FC FE09      CHPT35 CP S2WD+1
72FE 3891      CHPT40 JR C CHPT06
7300 13               INC DE
7301 3A6D74           LD A,(CHRCNT)
7304 3D               DEC A
```

```
7305 326D74          LD (CHRCNT),A
7308 2085            JR NZ CHPT04
730A C9              RET
730B D5       SETPRT PUSH DE          ; SET UP PRINTER FOR
730C 3A7274          LD A,(WIDTH)     ; GRAPHICS
730F 47              LD B,A           ; Find number of dot columns
7310 3A6D74          LD A,(CHRCNT)    ; along present line.
7313 5F              LD E,A
7314 1600            LD D,0
7316 210000          LD HL,0
7319 19       STP05  ADD HL,DE
731A 10FD            DJNZ STP05
731C 3E1B     STP10  LD A,ESC         ; Send information to
731E CD9A73          CALL PRINT       ; printer.
7321 3E4B            LD A,"K"
7323 DDCB0056        BIT 2,(IX+00)
7327 2802            JR Z STP15
7329 3E4C            LD A,"L"
732B CD9A73   STP15  CALL PRINT
732E 7D              LD A,L
732F CD9A73          CALL PRINT
7332 7C              LD A,H
7333 CD9A73          CALL PRINT
7336 D1              POP DE
7337 C9              RET
7338 AF       M1D4DT XOR A            ; FOUR TIMES NORMAL SIZE
7339 CB7C            BIT 7,H          ; Spread each bit over
733B 2802            JR Z M1D4D2      ; four bits.
733D C6F0            ADD A,0F0H
733F CB74     M1D4D2 BIT 6,H
7341 2802            JR Z M1D4D4
7343 C60F            ADD A,0FH
7345 5F       M1D4D4 LD E,A
7346 3E04            LD A,4
7348 327374   M1D4D5 LD (CNT),A
734B 7B              LD A,E
734C C9              RET
734D AF       M1D2DT XOR A            ; TWICE NORMAL SIZE
734E CB7C            BIT 7,H          ; Spread each bit over
7350 2802            JR Z M1D2D1      ; two bits.
7352 F6C0            OR 0C0H
7354 CB74     M1D2D1 BIT 6,H
7356 2802            JR Z M1D2D2
7358 F630            OR 30H
735A CB6C     M1D2D2 BIT 5,H
735C 2802            JR Z M1D2D3
735E F60C            OR 0CH
7360 CB64     M1D2D3 BIT 4,H
7362 2802            JR Z M1D2D4
7364 F603            OR 03H
7366 5F       M1D2D4 LD E,A
7367 3E02            LD A,2
7369 18DD            JR M1D4D5
736B DDCB0046 GETCHR BIT 0,(IX+00)    ; FIND CHARACTER IN
736F 2808            JR Z GTC00       ; TABLE
7371 D620            SUB 20H          ; Tables start from 20H.
7373 FEE0            CP 0E0H
7375 3809            JR C GTC02
7377 1806            JR GTC01
7379 D620     GTC00  SUB 20H
737B FE60            CP 60H
737D 3801            JR C GTC02
737F AF       GTC01  XOR A
7380 6F       GTC02  LD L,A
7381 2600            LD H,0
7383 29              ADD HL,HL        ; Index into table by
7384 29              ADD HL,HL        ; multiplying by 16.
7385 29              ADD HL,HL
7386 29              ADD HL,HL
7387 19              ADD HL,DE        ; Add start address.
7388 EB              EX DE,HL
7389 0610            LD B,16
738B C5       GTC03  PUSH BC          ; Collect column of 16
738C 41              LD B,C           ; bits in HL.
738D 1A              LD A,(DE)
738E 0F              RRCA
738F 07       GTC05  RLCA
7390 10FD            DJNZ GTC05
7392 87              ADD A,A
7393 ED6A            ADC HL,HL
7395 13              INC DE
7396 C1              POP BC
7397 10F2            DJNZ GTC03
7399 C9              RET
739A F5       PRINT  PUSH AF          ; OUTPUT TO PRINTER

              ;
              ; ENTER CODE TO SEND ONE CHARACTER
              ; TO THE PRINTER.
              ; AF can be affected.
              ;
739B F1              POP AF
739C C9              RET
              ; Program workspace.
              BUFFER DS 200           ; Line storage buffer.
              LINPOS DS 2             ; Position in buffer.
              MODE   DS 1             ; Graphic mode 0-9.
              STR03  DS 2             ; Current post. on line.
              BCNT   DS 1             ; Block counter.
              STR04  DS 1             ; Temporary mode store.
              STR06  DS 1
              CHPCNT DS 1             ; No. of Values.
              STR05  DS 2             ; Temporary table address.
              CPOSAD DS 2             ; Char. post. add.
              WIDTH  DS 1
              CNT    DS 1
              LFLTH  DS 1
              FLAG   DS 1             ; Flag byte.
                                      ; (IX+00)

                     ; Bit 0 - Set for S2WD/ Otherwise S1WD (MAT)
                     ; Bit 1 - Set when standard char. printed.
                     ; Bit 2
                     ; Bit 3 - Set not to print printer chars.
                     ; Bit 4 - Set when double width is on.
                     ; Bit 5 - Set for small letters/ Reset,BIT 6
                     ; Bit 6 - Set, large/Reset, medium letters.
                     ; Bit 7
```

Macro assembler listing



'. . . and the in-car computer gives you an up-to-the-minute calculation of the chances of your having an accident while watching the in-car computer.'

WRITING FOR PCW

PCW welcomes approaches from would-be writers, even those who have never appeared in print before. In this game it's often those with practical experience who have important things to say so we don't mind if your prose is less than perfect — providing submissions have a sensible structure and follow a logical sequence, we can take care of the polishing.

If your article is already written, send it in — taking care to ensure that your name and address, together with a daytime phone number if possible, appears on both the covering letter and the manuscript. Manuscripts should, preferably, be typed or printed out (dot matrix output is quite acceptable) but *must* be double line-spaced with ample margins top and bottom and on each side. Make sure you keep a copy of *everything* you send us.

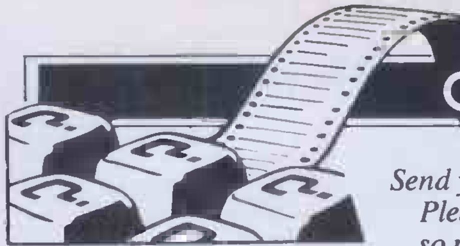
We can now accept articles on a limited number of disk formats: standard IBM 3740 single-sided, single-density 8in, and the following 5¼ in formats: Superbrain SSDD 35-track; RML 380Z SSSD; Sharp MZ-80K/A DSSD, Cromemco SSSD, Nascom DSSD, Rair/ICL DSDD, SD Sales SSSD, Triton 35 track SSDD and ACT Sirius 1 (CP/M-86 or MS-DOS) single-sided. By prior arrangement we can accept stuff over the phone by modem using BSTAM at 300 baud but as we can only do this during office hours (10am to 6pm) it's not exactly a cheap way of getting your article to us! In the near future we hope to be able to accept material by The Source and Rewtel. Please note that if you want to send your article in this way, it should be as an ASCII file rather than as a 'work file' for any one type of word processor — ie, use your word processor to print the text to disk instead of to paper.

Please note that we cannot undertake to return manuscripts, diagrams and photographs, although we always try to return the latter. We can only return disks if they are accompanied by adequate postage *and* packaging.

If you have an idea for an article or a series, write us a letter outlining your ideas. A one- or two-page synopsis giving the proposed structure, sequence and content is what we're looking for. But before you send anything to us, take a good look through *PCW* to see what sort of articles get published and to see what style of writing we prefer (basically, avoiding pomposity at one extreme and flippancy at the other). Also take a look through the Back Issues advert to see what sort of things we have already published — no point in re-inventing the wheel.

Once you've sent off your article or proposal, please don't hassle us for a decision. We receive far more submissions than we can ever use and it takes us a while to sort through them, acknowledge receipt and give an opinion one way or the other. Please be sure to tell us if you've sent the article to another magazine — it would be very awkward indeed if the same article appeared simultaneously in two publications! Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work but please be patient! Payment *normally* follows about 4-6 weeks after publication.



COMPUTER ANSWERS

Send your queries to Peter Bright, PCW, *62 Oxford Street, London W1. Please note that Peter cannot answer questions on an individual basis, so please don't send an SAE with your query.*

NewBrain disk drives

Does the NewBrain Disk Controller restrict me to using only NewBrain disk drives, or can I buy disk drives from other sources?
Mike Hart, London

You can use other drives subject to certain technical criteria being met.

The NewBrain Disk Controller can handle up to four drives, each either single sided or double sided. The standard Shugart compatible controller-to-drive interface is used. The single sided drive must be 40 track; the DSDD is 80 track 96 tpi 1 Mb unformatted. The track to track stepping time must be 20 msecs for the single sided or four msecs for the double sided, though these figures can be modified under the CONFIG program. If the drives you plan to buy are not within these specs contact your dealer and ask him to re-configure the system on their drives. An attempt to speak to the disk will give a NO RESPONSE FROM DISK CONTROLLER, if the drive does not match the system.
Dave Gunthorpe

Osborne spreadsheet

We have recently purchased a double density Osborne 1, with which we are pleased. Could you please tell us if there are any CP/M Printer's Estimating programs suitable for running on the Osborne?
Jason Clarke, London E16

My first reaction is that you already have one, because the powerful spreadsheet SuperCalc is supplied free with the Osborne. Although spreadsheets are often thought of for financial planning and budgeting, they can be used for most ordinary business tasks which involve calculations on a table of figures. This could include job costing, quotations, small scale stock control or repetitive engineering design calculations.

One advantage of spreadsheets is that you can evolve a worksheet or model to suit your needs as you gain more experience. For example, you can start with a simple costing model, then when you have identified all the standard cost elements, group them together so they can be loaded as an overlay from another worksheet containing your current scale of costs. Discount or surcharge rates can be built in. Part of the worksheet can become a quotation with headings, and it can be printed separately or passed to WordStar to include in a letter. Other details can be set aside for passing to other worksheets, for example, a jobsheet, a work-in-progress report or an invoice. Much of this can be semi-automated by making up command files for SuperCalc (though the Osborne manual doesn't tell you this).

Working with a calc is like working with electronic sheets of paper — you still have to move data around, you're just spared the chore of calculating and retyping it. Of course, a full costing and estimating system will do more, do it more automatically and from the moment you install it, perhaps be run by less skilled staff, but cost more to buy. (Disk space is limited on the Osborne. For a large system you may find the Trantor hard disk expansion necessary.) Which suits you probably depends on the scale of your business. For a system, I suggest you contact the suppliers in the Specialised Software listings in *Micro Decision*. The October issue had 17 entries for Printers. I found a wide range of products, from £400 to £3,000. Take good advice before your final choice, because of the effect on your business of an unsuitable system.
Len Warner

BBC disk transfer

Having added a disk drive to my BBC model B, I wish to transfer my Acornsoft and Program Power machine code programs to disk. I seem to be able to *SAVE them to disk, but the programs will not run on reloading. Help! — it is extremely frustrating still having to use cassette.
John Walsh, Ardrossan

We have 12 BBC model Bs linked by the Econet at the school where I teach. We need to transfer tape programs to disk so that they can be loaded via the network. Your answer to G C Vincent (August) makes me think it is not as easy as we assumed. Can you give more information?
S Ward, Popley, Basingstoke

The vast majority of BBC cassette software can be transferred to disk. The problem arises because the Disk Filing System grabs a large chunk of RAM for its own purposes, which means that programs running under DFS load higher in memory than from tape. Most Basic programs are not affected by this, but many programs must be loaded to a fixed position in order to run correctly. Commercial software, which often contains machine code to boost performance and to deter piracy, is usually upset.

There are three types of 'awkward' program: machine code, Basic programs which contain or load a machine code program, and large Basic programs (eg with Hi-Res Graphics) which need all the memory. Each type needs slightly different treatment, but the solution is first to save the program from a higher address, then to load it for use with a procedure which, once the program has been loaded under DFS, will shift it down to the intended start address and run it. After running the program, you will need *DISK (or *NET) to re-select the filing system, because its RAM has been used.

There have been a number of articles on this problem. Probably the best is by Wood in *Beebug*, vol 2 issue 4 August 1983, which gives a summary of the varieties of 'awkward' programs and deals in detail with putting them to disk. If you have a BBC Micro a subscription to *Beebug* must be considered an essential!
Mike Forster

Spectrum TV choice

Why can't I get my Spectrum to work with my new TV? It used to work very well with my old Marconi colour.
P Murchison, London

You do not say what make of television you now have. The Spectrum is notorious for not working with some Japanese televisions, so I suspect that this is your problem.

The most obvious way around your problem is to use a different television with the Spectrum (your old TV perhaps). As a general rule if you use a home computer and want to change your TV, it is a good idea to take the computer along to the shop and test the TV before you buy.

Another possible answer would be to re-tune your Spectrum. If you open up the case and look on the left-hand side of the board, you will see two variable resistors and two white variable capacitors. Now put some output onto the screen and adjust the resistors so that the output is as you want it.

One general point of interest to Spectrum owners is that the

new issue 3 PCB has had some changes made to the ULA in order to make it work with a wider range of TVs. The only problem is that in the process some software written for the issue 2 board may not work!
Peter Bright

MicroDrives

Now that Sinclair has finally launched its MicroDrives, will it be possible for me to use them on my BBC model B?
A Maxwell, Richmond, Surrey

This is a question that has been asked many times. The answer has been published before (see Computer Answers December 1982), but I will say it again.

At present the MicroDrives will only work with the special driver board on the Spectrum. However, I have no doubt that some bright spark will come up with a range of interface boards so that the MicroDrives can be used with other machines.
Peter Bright

VIC input

I am writing a home accounts program using a VIC 20 computer. Whenever an INPUT statement is reached the VIC 20 gives '?' as a prompt. Could I change this to, for example, a '£' for the entry of a sum of money?
Martyn Adams, Waltham Abbey

The simple answer is that with an INPUT statement you cannot suppress the '?' prompt. There are two possible solutions to your problem. If you do not mind a "?" being printed before the "£" sign, you can use the cursor control characters to trick the VIC into printing what you want.

10 INPUT "HOW MUCH [CR]£[CL][CL];X
20 PRINT X

If you do not wish the "?" to appear at all you have to use the GET statement and make the VIC print a flashing cursor. Below is the basis of the routine I use to get any input (numbers or text), including commas, colons and quotes (see Fig 1). Set P$ to your prompt, call the subroutine and the answer comes back in A$. (Note [CR] cursor right, [CL] left, [CU] up).
Brian Grainger, Independent Commodore Products User Group

Tandy line feed

I have just purchased an 8k Tandy Model 100. While I am generally very pleased with it, when I connect it up to my Epson MX80 printer, all the print-out appears on one-line.
M Conneely, Barnet, Herts

Your problem is one that is common to all Tandy owners. What has happened is that your printer is set up to expect a line feed (LF) code to be sent from the computer along with the carriage return (CR) code. The trouble is that Tandy computers strip out line feeds and only send carriage returns. This is fine if you use Tandy printers, not so good if you don't.

There are three ways that you can get around this problem:
1 Buy a Tandy Printer.
2 Manually insert a line feed in the text. This can be achieved by typing 'graph S' whenever you want a line feed to be performed. Although this works, it is not very elegant and having to remember to insert line feeds would be a problem.
3 Reset the DIP switches in the Epson. If you are willing to open the printer up, you will find a block of DIP switches. If you reset switch 2 then the printer will perform a line feed whenever it sees a CR.
Peter Bright

Electron compatibility

I am thinking about buying a new Acorn Electron. Will I be able to run software from my brother's BBC model B machine?
A Kyle, London

Acorn has designed the Electron to be as compatible as possible with the BBC machine. They both use the same version of Basic. Having said that, there is one major difference between the two machines that you will have to watch out for. This is mode 7 graphics. The Electron does not support mode 7 so you will need to re-write any BBC mode 7 routines in a lower mode (say, mode 6). This is generally quite straight forward.
Peter Bright

```
100 P$="HOW MUCH- £"
110 GOSUB50500
120 PRINTVAL(A$)
130 END
50500 PRINT P$;" ※▌";:A$=""
50510 POKE204,0:GETA1$:IFA1$=""THEN50510
50515 IFA1$=","ORA1$=":"ORASC(A1$)=34THENA1$=CHR$(ASC(A1$)+64)
50517 POKE204,1:PRINT" ▌";A1$;:IFA1$=CHR$(98)THENPRINTA1$;"▌▌"
50520 IFA1$<>CHR$(13)ANDA1$<>CHR$(20)THENA$=A$+A1$:GOTO50510
50530 IFA1$<>CHR$(20)THEN50560
50540 IFLEN(A$)<2THENPRINTCHR$(13);"□";:GOTO50500
50550 A$=LEFT$(A$,LEN(A$)-1):GOTO50510
50560 IFA$=""THENPRINT"□";:GOTO50500
50570 RETURN
```

▌ = Cursor left   □ = Cursor up

Warner's corner

Bibliophile: *Paperbase* is a booklet of Basic programs designed to maintain and search files of references for the working scientist, and at £25 (£10 to individuals) is a cheap solution for N Weaver (August). The programs are written for Microsoft Basic on a two drive CP/M system, but there are extensive notes on conversion to other dialects. The four line reference format is not limited to bibliographies, so this could be a way of getting to know your micro and doing some useful programming. Wight Scientific, 44 Roan St, London SE10 9JT. Tel: 01-858 2699.

For confirmed DIY programmers with data problems, I suggest Finkel & Brown's *Data File Programming in Basic*, Wiley £9.75 (also in a Tandy edition), or Swanson's *Microcomputer Disk Techniques*, Byte/McGraw £12.75. If your local bookseller can't oblige and you are in Micronet, Watford Technical Books catalogue starts on Prestel page 28844.

STATUS-1500 is a user group for the PC 1500 (Sept). Subscription is £10.50 for 12 issues (backdated to Feb, so you don't miss any). Write to its editor, Ronald Cohen, 62 Blenheim Crescent, London W11.
The PC 1500 *Technical Reference Manual* is obtainable from Sharp's Calculator Repair Department in Manchester, price £20. It includes some important technical info not in the TRS News articles.
Modems: Interlekt has sent me some literature. It doesn't have a one-box answer for Mr Morgan-Owen (Sept), but seems well-priced. The SB7512 is a Prestel modem. The matching Answer end, the SB1275 (£187) can have auto answer at £56 or auto dial/ans at £138 extra. Most interesting is the SB-SC option for both (£74) which converts the 75 Baud interface to 1200 Baud, since very few micros apart from the BBC can manage the asymmetric data rates. Phone Reading (0734) 589551.

END

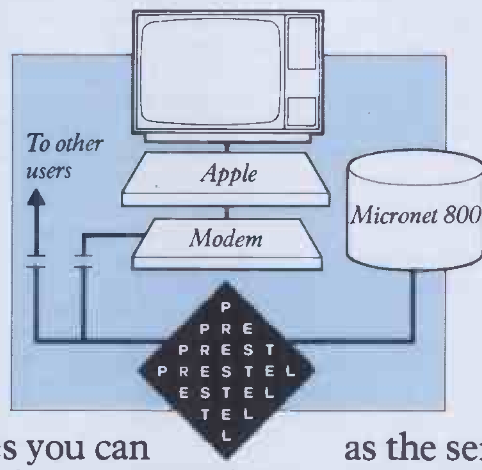

apple II
micronet 800

Micronet 800. The fast expanding service that gives micro users access to a huge database of information, hundreds of software programs, and communication with other users.

Combine it with the Apple – the microcomputer that showed the way to inexpensive computing both at work and in the home – and you open up a vast new world of possibilities.

Choose from a range of modems and software packs to connect your Apple II or IIE, via the telephone line, to a system that will give you more than you ever dreamed possible.

Micronet 800 is fun, friendly and inexpensive to run. Choose from hundreds of free games, download and use them on your Apple whenever you like, play on-screen games (as easy – and inexpensive – as a local phone call), and compete in Big Prize games and quizzes. There's also a range of downloadable games you can buy for less than over-the-counter prices.



Learn through up-to-date education packages, and help run the household with simple business packages. And if you need fast facts about the world of computers, Micronet 800 provides constantly up-dated product comparisons, reviews, prices, dealership and 'best-buy' information – 24-hours a day, 7-days a week.

You can also access the full range of Prestel™ services. These include a comprehensive information service offering you up-to-date news, weather and many other topics of immediate interest. You can join Homelink, the world's first home banking service, from the Nottingham Building Society and the Bank of Scotland. If you're an investor, Prestel CitiService gives a full financial information service including the latest share and commodity price movements. Prestel also has a travel information and booking service which is widely used throughout the travel industry. Prestel is expanding fast, and new, improved services are constantly being developed.

Keep in touch – you can send electronic mail to any other Micronet 800 or Prestel user.

All this – and even more as the service grows – is available to you through Micronet 800. And, if you join the service before October 31, we are offering special discounts on the cost of modems and software packs. So don't delay – send the coupon today.

Micronet 800 –
way to serve Apples
s & fun.

Please send me all the information on Micronet 800, the modems and software packs I will need to connect to the service, and a subscriber's application form.

Name ____________________

Address ____________________

____________________ Tel: ____________________

micronet 800

Post to Micronet 800, Scriptor Court, 155 Farringdon Road, London EC1R 3AD. Tel: 01-278 3143.

PCW 11·83 APP

Prestel and the Prestel symbol are trademarks of British Telecommunications.
**Subscribers are responsible for quarterly Micronet 800 and Prestel subscription charges.*

One of the many faces on Prestel.

FOCUS ON VISI ON

Not content to rest on its laurels, VisiCorp, the company which achieved recognition with its VisiCalc spreadsheet package, is on the point of unveiling its latest software innovation, Visi On: a multi-window, integrated applications package. Robin Webster and Leslie Miner managed to get a sneak preview.

The software company VisiCorp believes it 'ignited the explosion of personal computer usage in business' by introducing the now famous VisiCalc spreadsheet package. Now VisiCorp has the computer industry wondering whether or not it is about to set a whole new standard for user interface design with its long-awaited, multi-window, integrated applications environment. Already, VisiCorp has made pacts with an impressive cross-section of the computer community: major hardware manufacturers have signalled support by signing licensing deals for the product. Xerox (which originally developed the whole concept for such a product), is adapting the product so that it will work on the Ethernet network system. Digital Research, the inventor of CP/M, has announced its support; and other third-party software developers are queueing to get their products into what they see as a potentially vast distribution channel.

The product is called Visi On (that's currently the official style — VisiOn, Visi/ON, Visi ON, etc, are out). With the current trend towards highly sophisticated graphics interfaces, you might expect Visi On to be an icon-based system, but it is not. The two major systems already on the market with which it will inevitably be compared — the Xerox 8010 (Star) and the Apple Lisa — have adopted graphic representations of common desktop objects, called icons, as the major method for entering commands and manipulating information.

In place of icons, Visi On's developer, VisiCorp, has decided to maintain and enhance the menu bar or menu line approach as featured in other 'Visi' software packages such as VisiWord, and other well known products like Lotus 1-2-3 (see review in this issue). There are a number of reasons, some technical, others subjective, why this decision was made and we will look at them in more detail later.

In common with the Star and the Lisa, Visi On enables a user simultaneously to work with the contents of diverse application program files in the form of 'windows'; rectangular regions that are designed to appear to the user like standard sheets of paper aranged on a desktop. These windows, and their contents, are moved around and generally dealt with by means of an input device known as a mouse. Unlike conventional up/down/left/right cursor direction keys which only allow straight line movements across character spaces or over line intervals, the mouse provides extremely precise, pixel by pixel, accuracy.

Having realised that Visi On is menu-driven as opposed to icon-driven, a newcomer might well think that this product, and those produced by Xerox and Apple, all provide much the same facilities and are therefore direct competitors.

This is not so.

To begin with, Visi On is strictly a software package designed to run (initially) on 16-bit microcomputers that support Microsoft's MS-DOS operating system or its derivatives such as the IBM PC's PC-DOS.

In fact, one of Visi On's chief features as a software product will be its portability across a wide selection of machines. Agreements have already been reached (or are under negotiation) with IBM, Digital Equipment, Honeywell, Texas Instruments, and Wang, whereby those companies will support the product on their personal computers. (This review was mainly carried out on a Wang Personal Computer, although a limited time was made available on an IBM PC as well.)

The Xerox 8010 and the Apple Lisa, on the other hand, are office systems which exhibit a very high degree of hardware/software integration. In other words, these systems were designed from the ground up to provide a complete operating environment — and not as software add-ons to existing pieces of equipment. There were reasons for the hardware/software integration, and consequently those machines provide a far more sophisticated range of features than are presently available with Visi On. The sophisticated systems include pull-down menus, extensive graphics capabilities, and black-on-white displays that are aesthetically pleasing and more characteristic of paper and ink documents.

Nevertheless, a lot of deserved excitement has been generated about Visi On since the main operating system/environment together with three applications packages — Visi On Word, Visi On Calc and Visi On Graph — plus an optical mouse will cost $1710 in the US.

This is, of course, good news for those who already own one of the systems to which the package will be ported, including all the other hardware requirements necessary to support it. You need a 16-bit machine running MS-DOS, a minimum CPU operating speed of 5MHz, 256k of main memory, one dual-sided (360k) floppy disk plus at least one 5 Mbyte hard disk (obviously a 10 Mbyte hard disk will do), and a directly addressable bit-mapped display with the usual minimum of 24 lines x 80 columns (in the case of the IBM PC and many of its work-alikes a colour/graphics adapter is required).

For those who do not have the right equipment, the entry price for outfitting a standard 64k main memory/one 160k floppy disk drive IBM PC with the extras will (in the US) set you back approximately ($5-6000), including the price of the PC. A suitably equipped IBM XT running Visi On will cost about $7,500.

This compares with a cost of about $80,000 — $250,000 for installing a complete, multi-workstation, Xerox 8010 network (Xerox does not really market these workstations as stand-alone items, but they are reckoned to cost between $14,000 to $17,000 each), and the $9,995 cost of purchasing a single Lisa (volume purchases by major customers typically lower this to $7,500).

It should be noted that VisiCorp is not alone in attempting to develop a window oriented software package that provides an integrated environment for different applications programs. One other participant in this new market is Quarterdeck Office Systems, a West Coast company that plans to launch a window-based software package called Desq by the time this review appears. The package will cost about $400 and initially run on the IBM PC. The idea behind Desq is far less complicated than the other products we've talked about. Rather than taking two to three years to develop a very sophisticated window-based environment for a completely new range of internally developed application programs, Quarterdeck has simply decided to enable users to integrate 'off-the-shelf' packages of their choice. A prototype Desq system has already shown that it can allow users to cut and paste data between the dBase II relational database and the Easywriter II word processor, as well as between one of the Peachtree accounting packages and the Multiplan spreadsheet system.

At the very start of the Visi On project (it began in 1981), VisiCorp may well have felt it would be the first to market such a package to the 16-bit microcomputer market. However, the launch of integrated products such as Lotus 1-2-3, MBA's

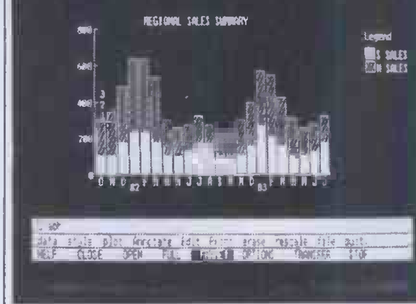


Fig 1 The Options Pane

Context, and the Apple Lisa soon dashed those expectations, and forced VisiCorp to maintain a presence in the potential market by pre-announcing Visi On.

For the last year or so VisiCorp has been able to show only a limited function demo package, thus giving rise to some criticism and generating all sorts of rumours.

Now let's take a look at how the product actually matches up with those rumours.

Using Visi On

The first intriguing thing one learns about VisiCorp's Visi On and the Lisa is that they were both constructed along the lines dictated by major 'user interface design' studies carried out at an early stage in the development process.

Both studies were extensive, including many stages of naive user feedback, and yet in some ways the two product interfaces are more different than they are alike.

While Visi On is largely dependent on textual menu selections, the Lisa is primarily an icon-based system. While Visi On is to be given extensive 'help text' facilities (when a user is unsure about how to proceed with some function, he or she just selects the 'HELP' function from the menu bar and relevant explanatory text will appear on the screen), the Lisa has virtually none. While Visi On comes with a two-button mouse, the Lisa version only has one (while that may seem to be of just trivial interest to most readers, it is a subject of some religious controversy in the new user interface business — sometimes referred to as 'human factors'). These are just a few of the relative differences between the products.

Starting up Visi On is simple since it resides on a hard disk drive and it is possible to boot the product up automatically from there. The machine we had access to for this review was a Wang Personal Computer with a 10 Mbyte hard disk drive. It is faster than the IBM PC since it uses the 16-bit Intel 8086 as opposed to the PC's 16/8-bit Intel 8088 chip.

It is also a more impressive machine on which to show Visi On since its screen is capable of displaying 800 x 300 pixels once the graphics adapter board is installed. The IBM standard colour screen can only display 640 x 200 pixels.

A two-button mouse was plugged into the machine's RS232 port, and while this was of the mechanical type, VisiCorp does intend to ship the product with a more reliable optical mouse. The problem with the mouse on the demo machine was that it could not be used on a polished wood desktop — a piece of paper had to be placed on the wood surface before there was enough friction to rotate the ball bearing accurately enough. Optical mice avoid the lack of friction problem because they have no moving parts; an optical system on the underside of the device detects how many points the mouse has been moved over a special grid laid on the desktop and simple circuitry converts these movements to electrical signals.

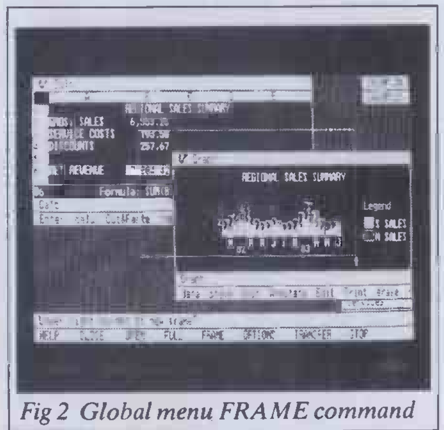


Fig 2 Global menu FRAME command

Visi On's architecture

Visi On's architecture is very complex, being composed of many intercommunicating layers. But it can be described fairly simply by concentrating on three major levels: Visihost, Visi On itself, and the Visi On activities (see diagram).

The host microcomputer, such as an IBM PC, will come with an operating system such as MS-DOS. MS-DOS communicates with the hardware through a software layer known as the BIOS, for Basic Input/Output system.

At the lowest level of Visi On there is Visihost, which operates as a type of BIOS between the main Visi On system and the host operating system. Visihost is actually a 30k chunk of code written partly in the C language and partly in assembler language. Its main purpose is to provide Visi On with all the machine facilities it requires, including file opening and closing, etc. Since it is the only part of the Visi On package which contains machine specific code, it is a relatively simple matter to develop machine specific Visihosts which can then carry Visi On in piggy-back fashion to each manufacturer's machine.

Visi On itself consists of about 128k of compiled C language code and data space, and communicates with Visihost via the Visihost Interface layer. Visi On is by far the most complex piece of software to come out of VisiCorp. Its response to users' commands or requests has been determined by what the company calls BITS (Basic Interaction Techniques).

These BITS (there are many of them) categorise the ways in which a Visi On user will typically interact with the application programs using windows, the mouse and the keyboard. They were formalised through a user interface design study VisiCorp undertook at the beginning of the Visi On project.

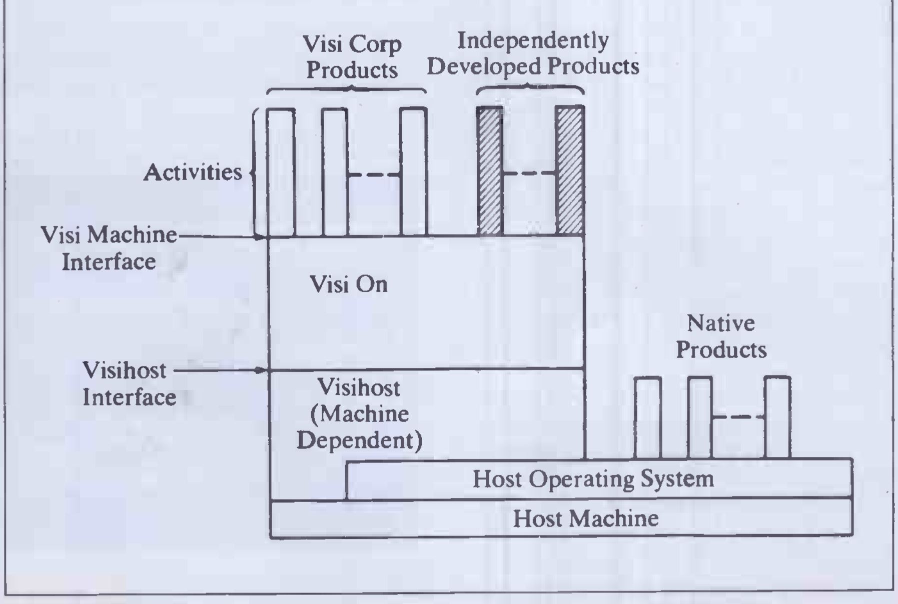
Above both Visi On and Visihost sit the Visi On activities, or application programs that will be accessed by the user. They are in touch with Visi On through a layer called the Visi Machine Interface. The first three products to be announced are Visi On Calc, Visi On Word and Visi On Graph — all enhanced versions of current VisiCorp products. VisiCorp intends to add further products to this line-up, including programs to handle database and data communications.

Windows

Before we really get into the detail of how the product works,it would make sense to talk specifically about the Visi On windows, since they are very different to those found on the Xerox 8010 and Apple Lisa — in some senses they are like shrunken versions of a traditional application program screen. What this means is that every window is made up of the file contents area attached to which there are a number of lines for displaying menus and/or messages specifically associated with that window.

There are three main parts, or panes, as VisiCorp tends to call them, to every window. Moving from the top of the window down they are:

The window header, or identifier: this is the top part of a window, which is displayed in reverse video, ie, dark characters on a light background. It is there simply as a name tag given by the system (in the case of pre-designed system windows) or the user (whenever a new file is created and given a name).



FOCUS ON VISI ON

The contents pane: naturally, this part takes up most of the window's area. The data displayed here is presented in normal video (light characters on a dark background).

The dialogue pane: this is actually made up of two inverse video panes separated by a thin horizontal black line. The top line is referred to as the information line for two reasons. One is that it indicates what stage the user has reached in an application ('DemoWord/Revise' informs that you are working with DemoWord in the revision mode). The second is that it is also used as a message area either to explain the action of a menu command selected from the lower line of the dialogue pane or to flash up prompts and error messages. Each window comes with its own range of menu commands in keeping with the context of the planned work. If you are going to do wordprocessing the menu will have a range of commands like 'delete, copy, move, find, doc-layout', while a spreadsheet will come with a whole different set such as 'formula, label, edit, replace, recalc'.

While there are three main components of the window always visible, there is in fact one more component which has to be purposefully called up by the user called **the options pane.** By going to the main Visi On menu (described further on) the user can select the OPTIONS command and then use the mouse to point at a specific window. The result is that what appears to be a second window attaches itself to the right-hand edge of the main applications window (see Fig 1). Option panes are provided so that the user can review or change application program specific defaults. The cursor can be used to pick any one of the options and the options window then closed.

Once you have two or more windows on the screen, it is inevitable that you will have to move them around or change their size to some degree. Here, Visi On has a far less elegant way of doing the job than Lisa, but it gets the job done. When a window must be re-sized on Lisa, you simply place the cursor at the bottom-right corner and either tug downwards and to the right to make the window bigger, or upwards and to the left to make it smaller. To move a window, you place the cursor on the window title (located at the mid-point along the top edge), keep the mouse button depressed, and then 'pick' up the complete window and 'lay it down' wherever you want to. The operations are very quick.

With Visi On you must use the global menu FRAME command essentially to redraw the window in its new location (see Fig 2).

First, you select FRAME with the cursor and are given the prompt 'Frame which window?' You point to the relevant window and press the select button once. Next, Visi On prompts you to indicate the 'Upper left corner of new frame?' with the cursor, after which you press the select button. This action tells Visi On the point from which it is to draw the left-hand side of the new frame. Finally, you are told to point to the 'Lower right corner of new frame?' As you move the cursor down and to the right, a flashing outline appears, allowing you to gauge the size of the new window. The cursor can be moved to and fro until the desired dimensions have been achieved. Once all these actions have been successfully concluded, the old window disappears and its contents reappear in the new window frame. Also, any windows underneath the original one now reappear.

While the differences between Visi On and Lisa here are not catastrophic, it should be said that there are some drawbacks to the Visi On notion of window-handling. It is not so easy to move the currently active window aside to see what is below it — you have to commit yourself to making the above moves or making the other window the active one. In other words you can't peek . . . the up/down roller-blind type of re-sizing on Lisa makes it a simpler procedure to look at documents arranged underneath the current one. Also, moving a Lisa window does not have any effect on its size — by having to redraw the Visi On windows it is a little more difficult to avoid unnecessary alterations.

There are really no major differences between the two systems in terms of how windows are closed. With the Lisa you can click on the window twice and it will shrink back into its icon form and move over to the right-hand edge of the screen. With Visi On, the user selects CLOSE from the global menu, points to the window to be closed, and it shrinks to a nine-character wide rectangle placed along the right side of the screen. This label, or 'brick', is probably the closest that Visi On gets to using a pictorial representation since it resembles a folder on a desktop.

Visi On commands

After booting up Visi On the user is presented with a screen containing the Services box which is shown at the lower right in Fig 3.

Across the bottom of the screen there is the menu line, or what VisiCorp calls the global menu. This global menu is always displayed and always contains the same nine commands in the same order.

Fig 3 Services

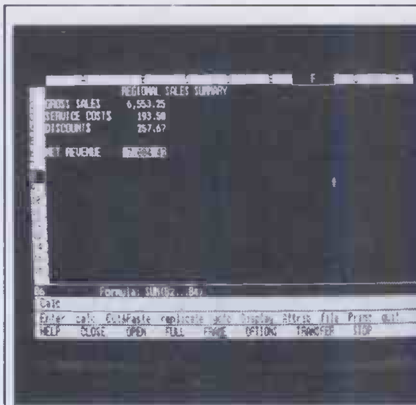


Fig 4 Full screen window

The commands are: HELP, CLOSE, OPEN, FULL, FRAME, OPTIONS, TRANSFER, STOP and SAVE. We will be explaining how these are used during the review, but for the less patient there is a brief description of each command below.

HELP — In line with many other help facilities, this command is used to provide an explanation of any function currently in use.

CLOSE — Used to close, or remove a window from the desktop.

OPEN — Used to open a selected window which is closed, or to shrink a fully-opened window (see next command) back to its previous open size and location.

FULL — Takes a partially open window and expands it to the full size of the screen.

FRAME — Used to re-size and/or relocate an already open window.

OPTIONS — Used to display a special options window that is automatically attached to the selected application window. In a spreadsheet the options would relate to formula set-up or cell formats, for example.

TRANSFER — Used to carry out cut-and-paste, or information interchange operations.

STOP — Used as a type of 'cancel' key if you do not want to continue with a previously selected command, or as a way of halting long processing tasks.

SAVE — Used to store the current screen image in a file called a workspace. In other words, it saves everything as you left it so that you can resume where you left off.

You select one of these commands by using the mouse. The VisiCorp mouse will be supplied with two buttons; the left button is used to select something on the screen, such as a window or a particular line or character inside the window, and the right button is used to scroll the many vertical and horizontal menus that appear. Whenever a command is selected it is backlighted for visual confirmation. As a general rule, most text selected by the mouse will flip to reverse video, be it dark characters on a light background or vice-versa.

Services

As already mentioned, there is a small rectangular area containing text at the bottom right of the screen in Fig 3. This is called the Services window and it can be likened to the ProFile icon on the Lisa system since it shows the user what applications are currently available. Since it is the first window that a Visi On user will encounter, it's worth going into some detail about its features.

On the Lisa you open up the ProFile icon by clicking on it twice and then selecting whichever application you require; with Visi On's Services window you begin work by selecting the command 'start', scrolling through a list of installed product names (DemoCalc, DemoPlot, DemoWord, etc,) until you locate the one you want, and then pressing the select button again. This causes a prompt to appear requesting a filename (the location is programmer or user definable). Once the filename is supplied, Visi On then opens a window with that name somewhere on the screen.

If you look at the Services window in the photograph you will notice that it is composed of the four distinct panes we described earlier, in the style of the Visi On window. At the top is a header line which simply contains the word 'Services' to identify the window's purpose. The next and largest pane displays the application product names which can be chosen after selecting the start command in much the same way that a Lisa user would 'tear-off' a piece of, say, LisaCalc paper.

The system under review appeared to have a group of programs — DemoCalc, DemoPlot, DemoWord, DemoComm, and DemoData — already installed. As it turned out, though, we only got a chance to see the first three in the list.

Still within this large central pane, there are three more lines of text marked 'Files', 'Scripts' and 'Workspaces'. While the Files option simply displays a list of all the files created by the various application programs — a directory — , the latter two functions offer the user some special Visi On capabilities.

If a user has some repetitive tasks to do, the Scripts function provides a means by which a complete sequence of commands, including mouse selections, can be recorded and re-run automatically at some later time. To invoke this function the user simply chooses the Scripts menu selection and then goes about his/her business. When the job is finished, the Scripts function is turned off. The sequence of operations are then saved as a named file which can be run whenever required. While this capability is not too unlike the glossary feature available on many word processors which allows the user to type commands into a file almost as if they were programming in a high-level language, the fact that Visi On will do it automatically, and at a much higher level, is a real bonus.

The Workspaces function essentially takes a snapshot of the current Visi On status when the user leaves the system — that is, it notes the current layout of the screen, the contents of the windows, and any other information that is relevant to recreating the image for the user when he returns to carry on with his work. It is a big advance on the way in which some spreadsheets and wordprocessors will simply return you to the last cursor location when you reload a file, and this is, of course, dictated by the desktop metaphor.

The next pane also looks as though it is simply titled 'Services', but it is being employed as part of an actual menu selection area this time. Since the Services window has all the properties of a normal Visi On window, it can be re-sized to display more of its contents at any time. Generally, the application program entries will not be too much longer than those shown, but the two bottom panes will always require a window 30 — 35 characters wide before they really make immediate sense.

Next to the word Services, for example, a small explanatory message will appear every time the cursor is placed over the commands 'start' or 'install', which are arranged on the pane below.

Selecting 'install' will result in the message 'install a new product' appearing next to the word Services as confirmation, for example. In this instance, install is for transferring a new floppy-based application onto the hard disk.

However, other commands will be provided to the right of start and install that will deal with the installation or removal of I/O devices like printers and plotters and exiting from the Visi On environment to the host operating system.

Instead of re-sizing the Services window, a quicker, but more tricky method of reviewing your options is to scroll the start line to the left by placing the cursor on it, pressing the right-hand scroll button, and then essentially 'pushing' the text off to the left by moving the mouse in that direction.

Text can be scrolled at a slow, medium, or fast pace, depending on the magnitude of the initial push. To stop the scrolling motion you lift your finger off the scroll button. To scroll to the right you just push the mouse to the right with the button still depressed.

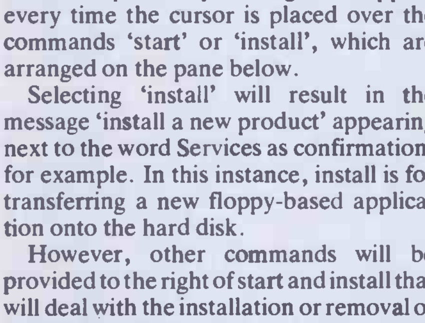


Fig 5 Read Only Text files

Bearing in mind that we were using a fairly inaccurate mechanical mouse, it nevertheless seemed a little difficult to control the speed of scrolling and therefore spot the required command in time before it was whisked out of sight beyond the window's border.

This problem should be reduced once the user becomes more familiar with the menu layout, and the action of pushing lines or columns of text around. It might also make more sense to maintain a fairly wide Services window so that at least three or so commands can be seen at one time.

Application

We next selected the DemoCalc application from the Services menu and opened up an application window.

The size of the initial window is something that the user can set, within certain limits. It makes no sense, for example, to have all the windows appear so small that it is impossible to see their contents, or so large that they obscure all other windows already on the desktop.

Returning to the global menu, we decided to use the 'FULL' command and make the DemoCalc window grow as large as the Wang screen would allow. It is likely that this will be the preferred way initially to create documents/spreadsheets/graphs since the smaller windows would require too much scrolling of contents. Having a number of windows on the screen simultaneously only generally make sense if you are intending to transfer data between documents that are pretty much complete, or if you are visually comparing graphs or spreadsheet/document layouts.

A full-screen window looks exactly the same as a smaller window, but the two sections of the dialogue line lie directly on top of the global menu line at the bottom of the screen as shown in Fig 4. A wide selection of menu commands are shown, and there is now ample space for prompts and errors messages to appear.

At this point, there is little visual evidence (other than the global menu) to differentiate Visi On from the way, say, Lotus 1-2-3 displays menu selections and screen layouts.

The key difference, though, is the fact that you can use the mouse-controlled cursor to handle all sorts of data manipulations.

Transferring data between windows

It doesn't take much to develop a software package that can put windows up on the screen . . . the real problem is to make it possible for the user to transfer data between such windows in a reliable, common-sense manner.

As with the re-sizing and moving of windows, Visi On's method of data

FOCUS ON VISI ON

interchange differs from that on the Lisa. The main difference is that Visi On requires you to answer prompts, while Lisa simply requires you to follow the ever-present 'cut and paste' procedure.

A simple transfer might be to take a row of new totals from a spreadsheet window and place them in a graph window so that last month's sales figures, for example, are updated. This is a facility which business planners will find very visually impressive.

To accomplish this with Visi On you must do six operations, as shown below:
a) first, you select the TRANSFER command from the global menu;
b) next, you answer the prompt 'Transfer from which window?' by pointing to the spreadsheet window;
c) Visi On then begins to steer you into the specific data to be transferred by prompting 'Start of region to transfer?'. You point to the beginning of sales total line;
d) the next prompt, 'End of region to transfer?' is answered by pointing to the end of the sales total line;
e) the penultimate step is to answer the 'Transfer to which window' prompt by pointing to the graph window; and
f) finally, you complete the whole operation, answering the prompt 'Where to put transferred region?' by pointing to the graph area in the contents pane.

The result of data transfers depends on the nature of the source and destination windows. If the source is a spreadsheet and the destination window is a graph, then the transferred data will be automatically 'absorbed' by the graph system and the screen image will be updated.

If the new incoming data bears no resemblance to the previous graph layout data then the graphing system will 'do the best it can', as one of its designers said, to try and accommodate the situation. Essentially, it will revise the graph grid so that the tallest graph element is accommodated on the y-axis, and a suitable range is allowed for along the x-axis. Any legends or other text specific to the original graph are removed.

All transfers, be they 'application to like application' or 'it will do the best it can' types, are handled directly by Visi On in what might be called its go-between mode.

Once all the transfer prompts have been successfully completed, Visi On first takes a look at both the source application program and the destination program to ascertain what data types can be moved between them, given the contextual rules relating to the procedure.

These rules employ the common-sense logic that if you are transferring data between wordprocessing documents, or between spreadsheets, then you can transfer everything. But if you want to transfer from a spreadsheet to a wordprocessing document then it is not necessary to go the whole hog — formulas, format codes, and all other spreadsheet paraphernalia will be stripped off.

During the brief time we had access to the prototype Visi On system it was not possible to indicate what the effects of each and every data transfer would be, but those that we did observe were more than satisfactory.

The HELP system

Traditionally, most help systems have just been read-only text files that can be called up by hitting the '?' symbol or pressing return after placing the cursor over the menu command 'HELP'. Before displaying anything, the program checks to see what stage the user is at and then goes off to find the most relevant help text file on the disk. This, all too regularly, is a fairly limp paragraph or two that generally tells you what you have already had to guess for yourself.

While this approach might suffice for fairly simple program environments, a more adventurous system such as Visi On requires something more tailored.

VisiCorp has come up with the idea of creating a network of read-only text files (hypertext in company jargon) that can start off at a fairly simple level and lead the user to ever more comprehensive instructions (see Fig 5). At the top level there are files which describe how Visi On itself can be used — a table of contents more or less; at the application program level there are more task specific texts.

When we did this review — early August — Visi On's help facility, invoked by selecting the global menu command HELP, came with four choices. 'Overview' calls up new text that is more general than that currently selected. 'Contents' simply brings back the Help system's table of contents list. 'Back' returns the user to his/her exact location in the previously listed screen of help text. 'Quit' enables the user to back out of the help mode when enough information has been gathered.

A rather good feature of Visi On is that it not only allows you to move around a collection of help texts in a controlled manner, but once you have found a group of help texts which are going to be used repeatedly by yourself, or others during their training, it allows you to save those texts as a group of closed windows at the right of the screen. These problem specific windows can then be operated anytime trouble occurs.

Archives

A big omission on the Visi On system we reviewed was that there appeared to be no way of correcting mistakes, as when the wrong file is inadvertently deleted. With Lisa, a deleted file is temporarily placed in a holding area represented by the 'trash-can' icon. According to Kurt Lynn, product manager for Visi On products, the Archives facility on the Visi On system will provide a similar capability, but for maybe up to as many as ten files at a time.

Since the Visi On development team was carrying out a major revision of the file handling system associated with the

Fig 6 Archives Function

Archives option while we were at VisiCorp's California headquarters, they were not in a position to discuss the matter too deeply. All Lynn would say is that by selecting Archives from the Services window — it will probably appear in the lower part of the window along with Files, Scripts, and Workspaces — a user will be able to go back in and undo files' deletions, among other things.

Visi On does not provide any equivalent to the 'revert to previous version saved X minutes/hours ago' option available on Lisa. This is unfortunate since there are times when it is quite possible to mess a file up so badly that it must be dumped rather than re-worked, and a previous version recalled.

Conclusions and comments

A few weeks after we were able to examine the prototype version of the product, VisiCorp contacted us with the news that a more complete Visi On installed on an IBM PC was ready for demonstration. We were able to go back for additional information on the product and for answers to a number of questions that arose from the first visit.

The first time around it was difficult to come up with a firm conclusion about whether or not Visi On would meet the expectations that had been raised for it — including, at the time of writing, the October launch date set in the US.

The prototype we saw was missing many features, including some quite fundamental ones, either because the company wanted to keep them under wraps or because they were just not ready. At the superficial level, the prototype could load and run files and exhibit some of the behaviour you would expect — but not enough to give the feeling of security and productivity.

The Wang PC-based Visi On ran quickly, but it certainly wasn't burdened by large files. Nor was it subjected to the many other stresses a commercial version will have to endure.

Originally we felt that there could be some cosmetic improvements to the design of the windows and the 'half-tone' background/desktop, too. At some points it seemed that the screen was overly cluttered; after some thought we determined that this was because of a design decision by VisiCorp, rather than pixel resolution, ie, because there is so much text on the screen VisiCorp decided to put all menus and window identifiers in reverse video (dark characters on a light background), while the user data, that is the applications, are presented in normal video (light characters on a dark background). Tied to the fact that there is a minimal window border, it would take some time to distinguish immediately the work text from the Visi On text. The point, however, is not are the windows pretty but are they useful?

On taking a second look at Visi On we noticed that it had been speeded up quite dramatically due to the introduction of a full virtual memory management system and that some cosmetic improvements had been made to Visi On's visual interface. Although it was a fairly minimal change technically speaking, the use of a new, leaner, typeface has really made the windows and the many menu lines look much cleaner and crisper.

Also, the Services window is now more distinctive, since the simple 'Visi On Word', 'Visi On Calc' and other application product names listed within it have been replaced with the more aesthetically pleasing 'V Calc', 'V Graph', 'V Word' and 'V Data'. The 'V Data', by the way, refers to an as yet unannounced relational database product that VisiCorp intends to release before the year end. It will actually be called Visi On Query and will feature a proprietary file access method.

Observant readers will note that although we earlier explained that the global menu has the nine commands HELP, CLOSE, OPEN, FULL, FRAME, OPTIONS, TRANSFER, STOP, SAVE, the photographs shown here show that the SAVE command has been deleted. This is because that command is now being implemented via the Archives feature (explained in more detail below).

Another problem with the windows is being addressed; when you have two or more windows on the screen and they do not overlap, it is difficult to tell which one is the active window. With the commercial version, the user will be able to identify the active window far more easily since it will always have an extra bright border drawn around it.

It is clear that VisiCorp still intends to meet the late October launch date — indeed, most of VisiCorp's newspaper and magazine adverts (including those for the recently announced VisiCalc IV system) carry some mention of Visi On's impending appearance. Unfortunately, the product will not appear with all the promised features.

A notable absentee will be the Scripts feature mentioned earlier, which allows users to set up special command files that will automatically repeat some tedious task; logging onto a remote database or formatting a spreadsheet in some preferred manner, for example. According to Kurt Lynn, product manager for Visi On, the Scripts feature has proved to be a far more complex facility to implement than had at first been envisaged. Consequently, the whole Scripts component of Visi On is being reworked and will probably not appear until the end of the year.

In its own way, though, the Scripts system is currently helping VisiCorp designers complete the Visi On system in general far quicker than might have been the case. In one large room at VisiCorp's San Jose headquarters, a number of IBM Personal Computers have been programmed by means of the Scripts system to act as if they were bona fide users. Output from these PC's is then fed into another IBM Personal Computer which is running the Visi On system. Event or error trapping software keeps an eye on the proceedings, making sure that all problems and, hopefully, their causes are recorded for later attention by software engineers. In this way, said Lynn, weeks of work can be reduced to less than a day.

Earlier in this review we gave some details about the 'Archives' function, stating that it was not quite complete at the time of our initial visit. While we did get to see the Archives function in action the second time around, it was still not totally implemented.

Fig 6 shows the type of screen that appears when you select the Archives function when in the 'V Graph' application.

The Archives screen, or 'space', is split into three sections: the main folder level (containing the filename's Stock, pat's folder, and exercises); an area which contains the Visi On equivalent to jottings (containing S SALES . . . Ser, N SALES . . . Ser, and SOAP STOCK . . . Gra, etc); and, finally, the Working Folder area where the contents of any of the above can be displayed (the contents of the small files S SALES and N SALES are listed). To select a folder you simply point to the relevant name which is then backlit.

To be frank, we weren't incredibly impressed with this feature when compared to the many other aspects of Visi On, but Kurt Lynn did indicate that further work was taking place to smooth out the way the Archives facility was presented to the user. 'We have been around and around in circles trying to decide whether Archives was even the right name,' said Lynn. 'We've looked at the possibility of calling it the file cabinet area, the holding or storage area, and even the library, but right now our tests seem to show that Archives is the closest name to the image we want to give.'

It should be noted that the second Visi On system, while it was generally a much better behaved product than its predecessor, did crash now and then because of what Lynn described as 'known gotchas'; some had already been dealt with, others were being tackled.

The new breed of 16-bit micros still need a powerful, reliable, yet simple to use interface if they are really to fulfil their potential in the business world. This could make Visi On a big hit. Moreover, a noteworthy group of companies has committed large sums of money to help develop Visi On for the personal, PC-to-mainframe, and professional workstation environments. They have a vested interest in seeing the product succeed.

Prices

Visi On System — $495
Two-button optical mouse — $250

Visi On Applications
Visi On Calc — $395
Visi On Word — $375
Visi On Graph — $195

Upgrade prices for current VisiCorp customers
VisiCalc to Visi On Calc — $195
VisiCalc Advanced Version to Visi On Calc — $50
VisiWord to Visi On Word — $50
VisiPlot to Visi On Graph — $50

END

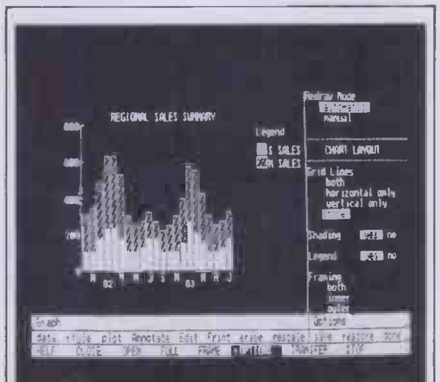
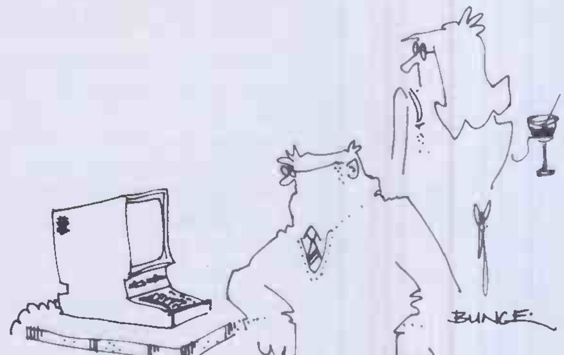


Fig 7 FRAME command



'124 kbytes of expandable memory and still you can't remember my birthday!'

BIBLIOFILE

Linnet Evans, in her inimitable style, gives a critical analysis of recent computer publications.

PASCAL FOR BASIC PROGRAMMERS

Learning to program through Basic is arguably like starting to play the guitar. A few lines of interpreted code run through the TV can produce the same culture-jamming results on Day One as the old plectrum and three-chord trick. (Yes. Amaze Your Friends!) Thus:

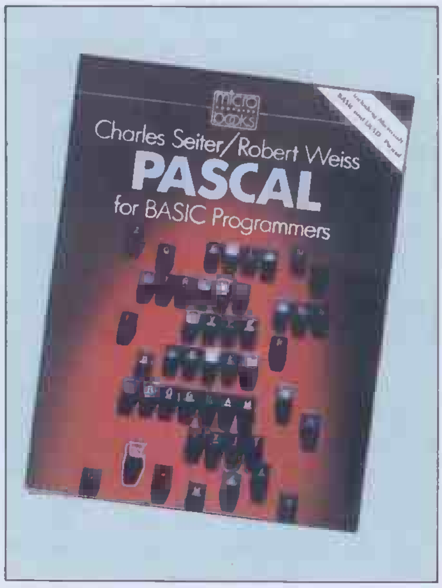
DIM GREENBOTTLES(9)
LET C + F + G = FOLKSONGS . . . etc.

Meanwhile, quantifiable success in both PL/1 and the *cor anglais* comes only with years of practice.

But this in itself is reason enough for Basic, in its ragged coat of many colours, to retain its hold now, and probably for years to come, as the first language for the personal computing market. Forth is currently still doing penance for the sin of being (too) different. Cobol has its place, but it ain't here. Which leaves Pascal.

Pascal has now of course become a major presence in both commercial DP and higher education; and it's largely through these channels that it's now becoming available to PC users.

Professor Niklaus Wirth's much-cited discipline of block-structured code has today turned into natty top-down design. And the much-lauded portable p-code remains somewhat shadowed by the myriad solutions to the fact of everything else being unportable. In practice, it's probably Pascal's inherent bent to problem-solving-as-fine-art that's really won its following. My suspicion is that in 1993, lodged in the bunker with our protein pills



and program generators, we may look back at Pascal as the noblest of all the high-level languages. . . .

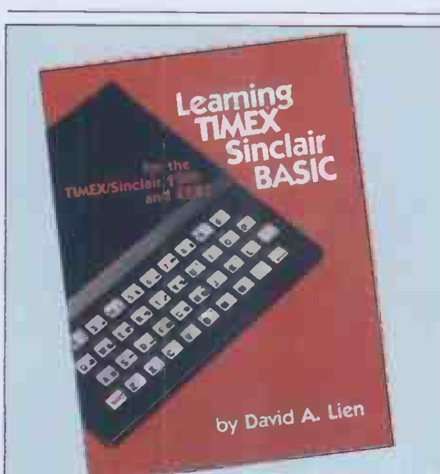
A few machines, notably the Sharp MZ-80, now offer a low-cost, up-front Pascal option. More often, for CP/M users, for example, it may involve splashing out £200-odd minimum for the experience. Worth it? In very different ways, one or both of these two titles should offer some guidance.

The authors of *Pascal for Basic Programmers* assume, reasonably, that there are by now plenty of potential customers for the former language equipped already with a real working knowledge of the latter. Not only does this mean instant liberation from the usual this-is-a-clever-microchip runaround which seems mandatory in introductory books of any kind. More crucially it gives the opportunity of comparing, constantly, with an informed readership, the known with the unknown. This special interaction in turn sets up a very enervating round-table flavour which survives from cover to cover.

In their neatly-titled opening chapter, *Pascal in One Evening,* Seiter and Weiss run some primary functions to ground. Only then do they take time out for a sightseeing tour of p-code and the equally famous syntax diagrams. Subsequent chapters outline further aspects of the language, cast more in terms of activities and applications than as an absolute tutorial. Winding up is a sidelong glance at a DIY syntax checker. UCSD Pascal is the baseline, with occasional notes on alternate implementations.

An exceptionally clear layout, plenty of bilingual examples (pitched broadly to personal/business usage), a lucid, energetic writing style and a thankful absence of cartoons make this a very likeable book to have in hand. It doesn't attempt to be a total guide: while the authors are very pro-Pascal — particularly for its panache in data classification — one sobering lesson to emerge is that there's a language for every job.

Pascal for Basic Programmers
Authors: Charles Seiter and Robert Weiss
Publisher: Addison-Wesley
Price: £8.50



LEARNING TIMEX SINCLAIR BASIC

Sinclair Research made a lot of money last year — pre-tax profits of £14.03 million to be exact. Unsurprisingly, a lot of people wish in turn to make a lot more money — or whoopee. Failing that, it's a matter of scaling Sinclair like the Eiger — because it's there. Or de-scaling? Or deskilling? Or?

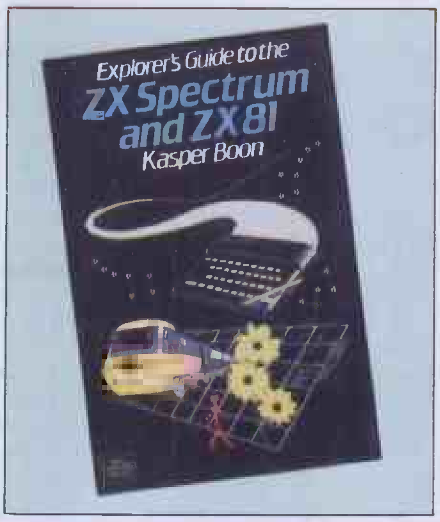
Learning Timex Sinclair Basic suffers curiously from the same ailment as *Mastering Pascal Programming* reviewed below, though they're poles apart in other respects. In both cases, it's a lessening of essential strengths by wrapping the text up to fit a certain marketable identity.

At heart, *Timex* is entirely solid, a well-sifted and graded blueberry-pie introduction to a kookie keyboard and some krazy koding notions. The fact that, give or take, it offers nothing that the native manual doesn't tell you, shouldn't be held against it, simply voiced aloud. David (*Basic Handbook*) Lien, something of a celebrity now in his own right, understands this particular audience and pitches accordingly: superbly. Thank God we're still different.

Learning Timex Sinclair Basic
Author: David A Lien
Publisher: Compusoft
Price: $14.95

Photography by Rick Kemp

EXPLORER'S GUIDE TO THE ZX SPECTRUM AND ZX81



The *Explorer's Guide to the ZX Spectrum and ZX81,* in equally superb contrast, is a totally loopy book, and not merely in the FOR-NEXT sense. It has the general air of a mad rummage for a feather boa at a jumble sale, fortified by a few crumbs and lumps of solder from the breadboard faction. Trying to visualise the 'ideal' reader for this one, I arrived at nothing better than someone who's *lost* the official user guide and feels like a field day as a result.

The bemused explorer is thereby shooed past a little nuts-and-bolts stuff in the opening chapters, which is fine if you can handle the Semantic Approach long before the REM statements. While there are some predictable resting points, notably the Spectrum's capacity for colour graphics, the author does cast an extremely sympathetic eye to the reduced circumstances of the 1k ZX81 owner: undoubtedly the mark of a true gentleman.

After the Readers Indigestion tack of the *Timex* volume, converting the beast to 'A Very Powerful Analog Computer', as explained by Kasper Boon in Chapter 16, has the air of alternate fantasy more usually found in the Business Opportunities pages of *Exchange & Mart.* The prospect of creating your own planetarium too, and engendering your own eclipses is pure Venus Interruptus . . . but what the hell!

Explorer is probably the operative word. But despite it all, the *Explorer's Guide* is a very exciting source book, and has to be transparently, wholeheartedly recommended.

Explorer's Guide to the ZX Spectrum and ZX81
Author: Kasper Boon
Publisher: Addison-Wesley
Price: £7.95 (Program cassette also available for £8.95 plus VAT)
Publisher: Sinclaire Browne Ltd
Price: £5.95

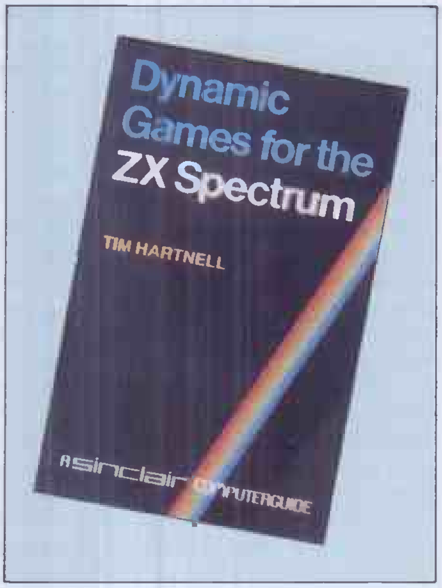
DYNAMIC GAMES FOR THE ZX SPECTRUM

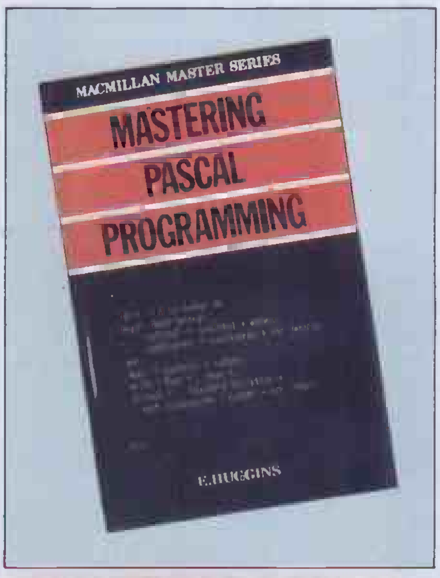
Almost overlooked, this book also carries a number of viable program listings for both machines. Cue therefore for the perfect foil with *Dynamic Games for the ZX Spectrum*. Tim ('Mr Sinclair') Hartnell certainly needs no introduction: here he has coordinated a collection of 20 or so games listings into an attractive pocket-sized book.

Divided into Arcade (the majority), Board, Simulations, etc, each game is listed in full, followed by generally brief but helpful notes on its workings, sometimes involving use of alternate subroutines. The cut-and-cover school of program design is in evidence now and again, but presumably that is just to enhance the intellectual stimulation. The games themselves, to a naff hand like myself, are eminently playable, with Circus and Jogger currently in the lead.

The Gothic Generator towards the end is no clone-of-Dracula, but a means of POKEing an alternate display character set into the Spectrum. ('Ideal for printing cheap greetings cards next year' . . . cheeky beast.) A spin-off from this garish practice must be to question why so many publishers insist on polluting their pages with listings printed in headbanging 9x7 matrix. Do we really need to look authentic down to the last crunched descender? Otherwise, it's a plus verdict for the *Dynamic Games* as an investment which should surely earn its keep. (Uh, maybe they should do a series?)

Dynamic Games for the ZX Spectrum
Author: Tim Hartnell
Publisher: Sinclaire Browne Ltd
Price: £5.95





MASTERING PASCAL PROGRAMMING

Having enjoyed *Pascal for Basic Programmers,* the picture did not look too rosy for *Mastering Pascal Programming.* To some extent this is reinforced at once by the house style of the *Mastering* series, in which Blaise has to bedfellow with Hairdressing, Principles of Accounts and the like — a farish cry from Macmillan's crisp *Computer Science* series.

Impelled to write for, one assumes, the ubiquitous 'student and general reader', Eric Huggins has to suffer the indignity of sitting his computer-naïve client down in front of a teletypewriter (for heaven's sake) and hand over something that in design and presentation could be mistaken for a good old school textbook on a dark night.

Dipping deeper, the story is actually quite different. Huggins writes with quiet authority and what is, in this business, almost alien dignity. His chapters are packed with, if anything, even more examples and allegories than Seiter and Weiss's. Yet the reader is never likely to feel swamped or undermined by such a skilled mentor.

Taking the recent British Standard as a yardstick, Huggins covers rather more ground in the sense of functions and usage. This in turn leads to some very interesting and unexpected spin-offs. The chapter on Simulation for instance (overtly marked as optional) broaches various statistical concepts and formulae likely to be genuinely unknown to the common computer-owner. A later chapter on real-time and multi-task programmer may be quite an eye-opener too.

A slight bias in Huggins' book to desk-based problems and commercial work is in reality no great hardship; and in his own way he sells Pascal just as effectively as the Californians.

Whether, at the end, you would feel sufficiently convinced to go out and buy the necessary software is likely to be a matter strictly between yourself and your bank manager. Certainly it should be hard to come away without a much freshened view of programming generally.

Mastering Pascal Programming
Author: Eric Huggins
Publisher: Macmillan
Price: £10 (hardback), £2.95 (paperback)

YANKEE DOODLES

Sol Libes presents his monthly round-up of news and gossip from Stateside.

Random Rumours

Sharp Corp, which recently demoed a portable computer with an eight line by 80 character display, is rumoured on the verge of introducing a liquid crystal display with a capacity of 24 lines by 80 characters . . . Beta testing of Version 3.0 of MS-DOS which was supposed to begin in June has reportedly been pushed back to September at the time of writing which probably means that introduction may not appear until next year. It is still not clear whether Version 3 will be adopted by IBM for the PC. The new version is expected to include features such as multitasking, mouse input and enhanced graphics . . . Meanwhile, Apple is expected to introduce its long rumoured 'MacIntosh' computer in January 1984 with first deliveries to customers expected in February. It is expected to be a 68000-based transportable unit having a nine inch display, a resolution of 512 x 375 pixels and 128k bytes of RAM and sell for well under $1500. Expected also to use a 3.5in floppy storing a full megabyte, have a significant portion of the system software in ROM and a user interface similar to the Lisa. When the Mac is introduced I expect to see the price of the Apple IIe drop to $700 or under and become available to mass merchandisers . . . Expected soon from several vendors are winchesters with intelligent interfaces that contain microprocessors capable of re-microcoding themselves to adapt to their environment. In other words they would contain their own operating systems. It will be possible with this system for the drive to have a signature that marks the drive as to lot and manufacturing date. This could be used to ward off software pirates. The chip to do this is already in evaluation by disk designers . . . Gavilan shook the industry with the introduction in May of a true full-function portable priced at just under $4000. Now there are rumours that a similar machine is due shortly for one-third of the price . . . Rumoured from Microsoft is a plug-in board for the IBM PC which replaces the 8088 microprocessor with an 80286 true 16-bit unit so that users can run their Xenix, Unix multi-user, multi-processing operating system . . . Radio Shack is expected, later in 1984, to bring out a Model 100-like portable that is IBM PC compatible. It will use a CMOS version of the 8086 that is now available in sample quantities. The Model 100 (which is currently the hottest selling portable) presently uses the CMOS version of the Intel 8085 8-bit micro . . . Look soon for Commodore to discontinue the VIC20, drop the price on the 64 even further and introduce a new portable machine, using the Z8000 16-bit microprocessor to sell in the $500-600 range. The attempt is to undercut the new entries from IBM and Apple . . . Shugart is expected soon to start demoing their laser-based optical disk. Word is that it will cost $5000 or so and store 1.5 gigabytes (that's 1,500,000,000 characters) and you will not have to worry about a head crash when you bump it or get dirt or moisture on the disk . . . Atari is expected to introduce a home computer with integrated telephone and capability to control home appliances and heating/cooling systems.

Home computer losses

The losses in the home computer field for the last quarter amounted to over half a billion dollars. Texas Instruments disclosed that it lost $183 million, Atari $310 million and Mattel $24 million. In response TI, Atari and Mattel all fired their presidents.

Commodore was the only company to show a profit. Tandy does not break out the sales of its home computers but sales are believed to be faltering. There are only rumours that the sales of the Timex TS1000 (Sinclair ZX81) have come to a virtual halt.

Mass merchandisers, such as Sears and K-Mart, have indicated a slow-down in the volume of home computer sales. Problems are expected to continue as TI is rumoured about to cut the price of the TI99/4A unit to $50 in an attempt to clear several hundred thousand units out of inventory. Add to this the expected introduction of home computers from IBM and Apple and the woes of the home computer producers are expected to intensify. Atari still has a sizeable inventory of 400 and 800 units and is also expected to slash prices to below cost to liquidate their stock. Atari has also abandoned plans to introduce a computer keyboard attachment for the 2600 video game system. Timex is reportedly considering discontinuing the TS1000 with the introduction of its new 1500 and 2000 models. A major concern of the home computer producers is the introduction of the Coleco Adam system which is a complete home computer, game and word processing system for $600. Coleco claims already to have orders for half a million systems. The unit which wholesales for $525 does not leave much room for discounting. However, it has been pointed out that a purchaser could buy the basic unit and game unit separately for $550. Thus, this could end up becoming the actual selling price for the complete package.

It is apparent that the home computer market has changed dramatically this year. There is a preference for machines that are more useful and more powerful. As a minimum they have to be able to do word processing. And the market has become very price sensitive. Further, the market life of products is shortening; the five year life span of the Apple is a thing of the past.

Prices for home computers continue to fall. The Atari 400 and 800 can be had for as little as $62 and $199 respectively while the Commodore VIC20 and 64 can be had for $79 and $185. In fact, a complete Commodore 64 system including disk drive, printer and colour display can be had for under $750.

Apple doings

Apple, once the bread and butter of Computerland sales, has been largely replaced by the IBM PC. Last year when Apple tried to renegotiate a better contract with Computerland, Computerland baulked and dropped Apple. Many of the Computerland stores were then forced to buy their Apple equipment directly from Apple, losing their Computerland discount, while still paying an 8% royalty to Computerland on each sale. The result was that Computerland stores selling Apples were at a serious disadvantage to independent retailers. Apple purchasers have become very price conscious and this has led to discounting with the result that many Computerland stores have dropped Apple. Apple has responded by reducing the Apple price, offering it to more retail outlets, such as department stores, and packaging together systems with more competitive prices.

Apple has also disclosed that it has filed suit against 28 Hong Kong companies selling copies of the Apple II and that, in all but five cases, it has succeeded in getting restraining orders. The units, which sell for as low as $300, are for the most part made in Taiwan and imported to Hong Kong. Some even bear the Apple nameplate-logo.

In the meantime Apple announced over $42 million in profits for the last quarter, a 59% increase. Apple also announced that it made its millionth computer and that it shipped the Lisa right on schedule. However, demand of the IIe has reportedly flattened out as business user sales have decreased. The bulk of the IIe sales are now to the home and school markets.

Apple has run into some problems with the Lisa. Many customers are complaining about the hard disk drive with its limited capacity (only 5 Mbytes with about 4 Mbytes used by the Lisa software leaving only about 1 Mbyte for the user's files) and slowness in reading and writing (it can take more than a half a minute to load the word processor and a text file). Apple is thus expected to shortly upgrade the Lisa to a faster drive with 10 Mbyte capacity. Secondly, Lisa floppy disks, which are unique to the Lisa, are as scarce as hen's teeth. Apparently Apple did not plan ahead in floppy disk production. This has caused problems for independent software suppliers trying to sell software for the machine. The result is that there is a reported softening in demand for the Lisa and that units are immediately available from stock.

Apple is expected to introduce soon an option for the Lisa to enable it to run IBM PC software. This project is reportedly being handled by Microsoft for Apple with the product becoming available by mid '84. This option is seen as an important asset for the business world. Thus users will be able to run the Lisa operating system, MS-DOS, CP/M-68K, Xenix and Uniplus+. The last two are operating systems and will require the addition of a second 5 Mbyte drive and extra user ports. UniPlus+ is already being distributed by UniPress, Highland Park NJ and Xenix should become available soon from Microsoft.

Apple is also expected to launch a new marketing strategy that will see it marketing three computer lines based on the Apple IIe, MacIntosh and Lisa with the Apple III being dropped. Expect the IIe's price to drop to well under $1000 and be marketed as a 'home computer'. The Mac will be the entry level business machine with the Lisa the high-end business machine. A major new advertising campaign will be launched to project this strategy.

Timex/Sinclair sales drop

The sales of the Timex 1000 (*née* Sinclair ZX81), once the most popular home computer, have plunged and orders for its new 1500 and 2000 models are far less than projected. Timex, who pioneered the super-cheap home computer and led in the pricing battles, sold 550,000 units in its first five months. Sinclair had sold 150,000 ZX81s before turning distribution over to Timex. So far well over a million units have been made.

The 1000 has sold for as low as $27.95 and typically sells for about $45. The Commodore VIC20, TI99/4A and Atari 400 which sell for only $30-40 more and offer colour, more memory, better keyboards and more features have hurt the sales of the 1000 and many retailers have abandoned the unit. Even the Timex 1500 which typically sells for about $80 does not stack up well against these units. And the model 2000 is facing stiff competition from the Commodore 64 and Atari 800 which have better keyboards, graphics and sound.

Timex has therefore begun selling its systems to direct mail order companies and to companies who will sell the unit packaged with encyclopedias and textbooks. Also the units are being offered by banks and real estate developers as give-aways.

Commodore news

Commodore, which now has about 30% of the home computer business, is currently king of the home market-place. It has sold over a million VIC 20 machines, which typically sell for $70 a piece. This unit is expected to be phased out shortly and the model 64 dropped in price. The 64 has become the mainstay of the Commodore line since the company reportedly makes a profit of about $110 on each unit sold compared to only $20 on the VIC20. Thus, although less 64s are sold it provides much greater income. Commodore has also discovered that most people who buy the 64, which typically sells for $200, also buy a disk drive for another $275, on which they make about $160. Commodore has disclosed that it has sold 500,000 64s since it came out late last year compared to the one million VICs sold over a two year period.

Coleco announcement

Coleco, the only game-maker currently making a profit, showed its Adam integrated home computer in June promising delivery in late August. It then pushed the delivery date back to early October and raised its suggested retail price from $600 to $700 (the dealer price will be about $525). The final unit will have a tape recorder for mass storage and a slow speed daisywheel printer. A modem, memory expansion and disk drive options are expected early next year. Also, Coleco expects an option which will increase the current 32 character line to 80 characters on a TV.

Coleco also disclosed that it has signed an agreement with StarCom to market its 'Dragon's Lair' arcade game that employs a laser disk and a new dimension in game technology. Coleco has also signed an agreement with AT&T to develop a home video game service via telephone. AT&T will make and sell the video game machine that includes a modem.

Research cooperatives begin projects

The Semiconductor Research Cooperative, a subsidiary of the Semiconductor Industry Association, disclosed that it is initiating development of a pilot program to demonstrate the manufacturability and reliability of a 4-Megabit memory device. SRC is an alliance of 18 companies including IBM, GE, Motorola, CDC, DEC, Intel, AMD, HP, Silicon Systems and Monolithic Memories. SRC was formed two years ago.

The Microelectronics & Computer Technology Corp., (an R & D venture owned by AMD, Allied Corp, CDC, DEC, Harris, Honeywell, Martin Marietta, Mostek, Motorola, National Semiconductor, NCR, RCA and Sperry), has announced that it will be doing research in advanced computer architecture, computer-aided design and manufacturing, system and circuit chip packaging and software technology.

Random news bits

One of Tokyo, Japan's, largest department stores, Seibu, has put two industrial type robots on sale in its store. At $25,000 a piece they are not likely to sell many but they sure are attracting crowds . . . Imports of integrated circuits from Japan for the first four months of the year reportedly increased 63% for packaged ICs and a whopping 252% for non-packaged ICs. By contrast, shipments of ICs to Japan increased by 11% . . . According to the *Books in Print* reference guide, there are now 2400 computer books in print. . . . Intel is promising to start production on a 1-Megabit bubble memory device late next year that will sell for $99 in quantity . . . Microsoft will promote its new word processing program for the IBM PC by including a demo floppy disk in the November issue of *PC World* magazine. The program will be able to do everything but store and print the text. This promotion is expected to cost Microsoft several hundred thousand dollars.

Osborne computer on the ropes

Osborne Computer has laid off another 200 employees so that only 80 employees remain on the payroll. Reports are that it is deeply in debt and has large quantities of both the Osborne One and Executive in the warehouse. Predictions are that unless there is an immediate infusion of money the company will be 'down the tubes'.

END

A BEGINNER'S GUIDE TO PROGRAM CONVERSION
PART 3: BBC GRAPHICS

Surya begins the graphics supplement to the PCW *Basic Converter Chart with a look at the BBC Micro*

With many things in the microcomputing world, there are agreed standards. The ASCII code for communications; the RS232, Centronics and IEEE for interfacing; the 5.25in disk and so forth. But when it comes to graphics it seems that manufacturers and designers don't know the meaning of the word 'standard'. The reason for this is simple. In the time it would take to debate, argue, redesign and eventually implement a set of standards, the graphics capabilities of the machines being developed would have increased beyond all recognition, rendering the standards useless.

Different machines not only use different screen resolutions, but the range of graphics-handling statements supported varies from the simple SET, RESET and POINT to a whole array of sophisticated features like drawing circles and filling-in shapes. All this is a rather roundabout way of saying that it is not possible to cover the subject of graphics in the form of a quick-reference chart as with the *PCW* Basic Converter Chart.

What I have set out to do in this series of articles is to give you enough information about the graphics-handling of each machine covered by the chart to enable you to work out what is happening in a listing.

Incidentally, as a general tip when converting graphics, I recommend mapping out a picture of the graphics screen of the machine from which you are converting on square-ruled paper, marking on it rough values. Next, place a piece of tracing paper over this grid and follow the listing through, sketching in lines and text. You can then place this tracing paper over a map of your own screen to see roughly what values you will need to use.

This month I'm going to cover the BBC micro. The complexity of the machine's graphics often make BBC listings all but incomprehensible to owners of other machines. But there are a lot of well-written BBC listings in *PCW* which the aforementioned owners would no doubt like to get up and running on their own machines. For this reason, I think it worthwhile to go into the subject in a fair amount of detail.

The BBC Micro

The BBC micro comes in one of two models: the 'A' and 'B'. The only difference between the two as far as graphics is concerned is that the model B offers eight screen resolutions, or 'modes', while the A offers only four.

The BBC has very powerful graphics-handling capabilities. This is useful if you own one, but makes life difficult for anyone trying to convert BBC graphics routines. Let's start with the business of modes. The model B can support eight different screen resolutions, while the model A supports modes 4, 5, 6 and 7 only. A brief summary of the modes follows:

0 — 80×32 text, 640×256 graphics, 2 colours
1 — 40×32 text, 320×256 graphics, 4 colours
2 — 20×32 text, 160×256 graphics, 16 colours
3 — 80×25 text, 2 colours, text only
4 — 40×32 text, 320×256 graphics, 2 colours
5 — 20×32 text, 160×256 graphics, 4 colours
6 — 40×25 text, 2 colours, text only
7 — 40×25 text, teletext mode (see below)

Mode x, where x is in the range 0 to 7, clears the screen and places you into the appropriate mode. This can be done as either a command or statement.

Once in a given mode, the graphics statements are as follows:

CLG	—clears the graphics screen
CLS	—clears the text screen
MOVE x,y	—move the graphics cursor to point x,y
DRAW x,y	—draw a line from the current cursor position to point x,y in the current foreground colour
COLOUR x	—set the colour to be used for all subsequent printing of text, where x is an integer in range 0 to 15 to set foreground colour, 128 to 143 to set background colour. Note that the colour values are dependent upon the current mode: colour 2, for example, is yellow in a four-colour mode but green in mode 2 (the 16-colour mode). For an explanation of the colour codes, see below.
GCOL w,x	—sets the colour to be used for all subsequent graphics operations, where x is the colour and w is the logical operation defined as:

0 — use the specified colour
1 — OR the specified colour with any colour already present
2 — AND the specified colour with any colour already present
3 — XOR (eXclusive OR) the specified colour with that already present
4 — invert (that is, change to the logical opposite) the colour already present

Note that x is as for COLOUR.

PLOT	—more powerful version of draw: see below for further details

To set the text or graphics colour, numbered codes are used. These codes, as has been mentioned, are dependent upon the current mode. These codes can be reset (see VDU below — virtually everything you say about BBC graphics needs to be qualified in some way), but default values are:

Two-colour modes (0,3,4 and 6):

Black	—0 foreground, 128 background
White	—1 foreground, 129 background

Four-colour modes (1 and 5):

Black	—0 foreground, 128 background
Red	—1 foreground, 129 background
Yellow	—2 foreground, 130 background
White	—3 foreground, 131 background

Sixteen-colour mode (2):

Black	—0 foreground, 128 background
Red	—1 foreground, 129 background
Green	—2 foreground, 130 background
Yellow	—3 foreground, 131 background
Blue	—4 foreground, 132 background
Magenta	—5 foreground, 133 background
Cyan	—6 foreground, 134 background
White	—7 foreground, 135 background

Flashing colours:

Black/White	—8 foreground, 136 background
Red/cyan	—9 foreground, 137 background
Green/magenta	—10 foreground, 138 background
Yellow/blue	—11 foreground, 139 background
Blue/yellow	—12 foreground, 140 background
Magenta/green	—13 foreground, 141 background
Cyan/red	—14 foreground, 142 background
White/black	—15 foreground, 143 background

The last four colours, incidentally, are not a typesetting error but merely one of the BBC's little idiosyncrasies.

To recap, first of all a mode is selected. This determines the resolution and the number of colours available. Then the screen may be cleared (using CLG and CLS), and the text colour (COLOURx) and graphics colour (GCOLx) set. The graphics statements available are MOVE, DRAW and PLOT.

PLOT:
Whichever mode has been selected, the screen is addressed as a virtual screen 1280 × 1024 pixels. The origin (0,0) is at the bottom left-hand corner of the screen though this — like most things on the Beeb — can be repositioned if desired. As described above, DRAW x,y draws a line in the current foreground colour to the specified coordinates. MOVE x,y moves to the specified coordinates without drawing (OK — for the purists — it draws a line in the current background colour (s)). PLOT is a more sophisticated form of DRAW and uses three parameters which we'll call k, x and y since the manual does.

Parameters x and y are straightforward, these being the coordinates used. The parameter k determines the manner in which the line is plotted as follows:

0 — move (ie, draw in background colour(s)) relative to present position
1 — draw (in foreground colour) relative to present position
2 — as 1, above, but in logical inverse colour
3 — as 1, above, but in background colour. This differs from 0 in that the background colour will overwrite any foreground colours present
4 — move to position (x,y)
5 — draw line to position (x,y) in current foreground colour
6 — as 5, above, but in logical inverse colour
7 — as 6, above, but in current background colour

Note that 0-3 plot x points in the x-axis and y points in the y-axis; that is,the plot is relative. 4-7 move to the screen coordinate (x,y); that is, the plot is absolute.

Higher values of k may be used to achieve other effects. The ones which are currently implemented are:

8-15 — as 0-7 but with the last point in the line omitted
16-23 — as 0-7 but using a dotted line
24-31 — as 0-7 but using a dotted line and with the last point in the line omitted
64-71 — as 0-7 but plotting only the last point of the line
80-87 — as 0-7 but use last two points visited to plot and fill a solid triangle

You can see from the above that PLOT 4 is the same as MOVE and PLOT 5 is the same as DRAW.

There are also 33 'VDU codes', a number of which are related to graphics. These appear in listings as VDUx, where the most commonly used values of x are:-

5 — join text and graphics cursors to enable text to be printed at the present graphics cursor position. This is disabled using VDU 4
19 — a very common VDU code used to redefine logical colours. For example, colour 1 is normally white in two-colour modes, but the programmer may wish to change it to a different colour. Thus VDU 19 allows access to colours not normally available in a given mode. The statement takes the form VDU 19, logical colour code, new colour code, 0,0,0 OR VDU 19, logical colour code, new colour code;0;. Thus in mode 0, VDU 19,1,3;0; would redefine white to appear as yellow. VDU 20 resets all colour codes to their default values.
23 — define a user-defined character. It uses the same binary-based system as most other machines, the form being VDU 23,ASCII code of the character to be defined, followed by the eight codes separated by commas.
24 — define a graphics window, that is an area of the screen outside of which no graphics may appear. The form taken is VDU 24,lower x coordinate;lower y coordinate;upper x coordinate;upper y coordinate;. Thus VDU 24,100;200;300;400; would define a graphics window with coordinate (100,200) as the bottom left-hand corner and (300,400) as the top right-hand corner. This is reset by VDU 26.
28 — define a text window. This works as for VDU 24, only commas are used instead of semi-colons and no trailing punctuation mark is required. The text screen is 39×31 characters by default. VDU 26 resets default.

And that covers the graphics handling. Now for sound.

Sound

The BBC has two sound statements, SOUND and ENVELOPE. The SOUND statement is relatively straightforward, ENVELOPE is so specific to the BBC that it would be of little use to spend the not inconsiderable amount of time necessary to explain it. Even if you could work out roughly what sort of sound was being created, you would have no way of effectively simulating it on another machine. What ENVELOPE does is to define the shape of the sound generated by the SOUND statement, so you may not be able to recreate the sound faithfully.

The format is SOUND channel, volume, pitch, duration where:
* Channel is in the range 0-3, channel 0 producing 'white noise' and used to create special effects.
* Volume is in the range 0 to −15 with 0 silent (useful!) and −15 the loudest.
* Pitch ranges from 0 to 255, covering some five-and-a-bit octaves.
* Duration is in the range −1 to 254. −1 means 'continue until stopped' (either by pressing escape or by sending another note to the same channel), positive values are in twentieths of a second.

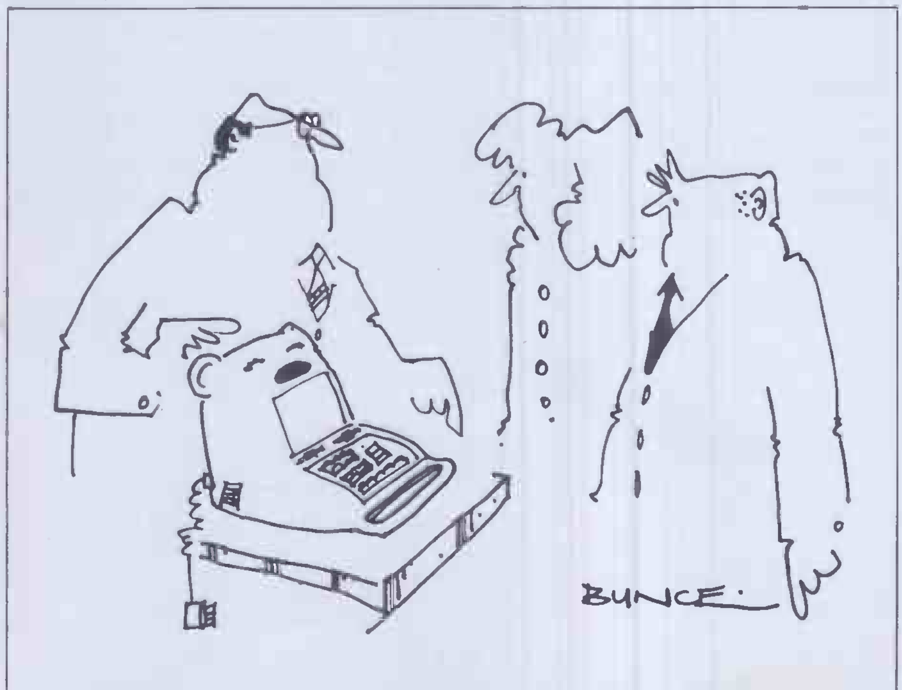
Sending two or more notes to the same channel at the same time produces a chord. Where channel 0 is used, the type of white noise produced depends upon pitch, the BBC manual summarising the effects as follows:

0 — high-frequency periodic noise
1 — medium-frequency periodic noise
2 — low-frequency periodic noise
3 — periodic noise, frequency determined by pitch setting of channel 1
4 — high-frequency white noise
5 — medium-frequency white noise
6 — low-frequency white noise
7 — white noise, frequency determined by pitch setting of channel 1

And that's the BBC micro! You do need to remember that without the equivalent of the ENVELOPE statement, you will not be able to achieve the kind of complex sound effects used in some BBC programs. Sound effects are generally the frills rather than the meat of a program, and while good sound effects can very much improve a program, they can usually be simplified without losing the effectiveness of a program.

More on sound and graphics next month

END



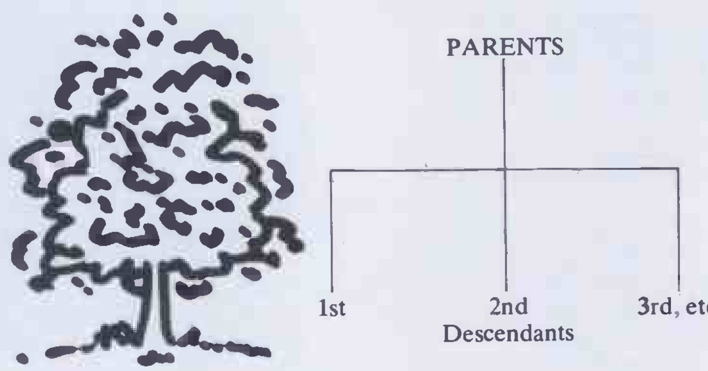
'Baby's first micro — it's unbreakable, washable and it's fitted with a special teething bar.'

SORT TREES FOR BEGINNERS

Following up his series on Warnier-Orr Programming, Paul Overaa now invites you to don your monkey-suit and swing through the branches of this commonly used data structuring technique.

Most of you will have come across the term 'data structure'. The ways in which we structure our data can make a dramatic difference to the efficiency and speed with which some applications programs will run. Stacks, lists, tables or arrays are examples of such structures that are commonly used by programmers and even novices soon acquire a certain proficiency and indeed a 'mental picture' of these concepts and the way in which they can be used.

'Tree Structures' are another very common way of describing and organising data and they have numerous possible applications. Trees get less exposure in the computing magazines than other data structures, possibly because they are considered to be rather complex. This is, to a certain extent, a misconception because in many cases the use of tree structures can actually simplify programs rather than complicate them.



This is not a tree

This is part of a tree

Fig 1

I have avoided the temptation to provide you with listings of various tree routines that are in common use. Instead I have decided to tackle the problem right from square one. What I shall do is take you on a 'guided tour' around the type of approaches I used when I first encountered trees. In this way it should be possible to understand the basic concepts before getting involved with writing or trying to understand specific routines.

All of you will know what a 'family tree' looks like and will also know that by convention they are drawn upside down, ie, parents are shown above their descendants. Fig 1 gives the general idea and also attempts to confuse those of you that are gardeners.

When we draw a family tree we are attempting to describe the relations between the parents, their children, the descendants of those children and so on. The important point is that we are showing how various items in the tree are related. In a computing sense the data structure called a tree is somewhat similar and the terminology used will often reflect this.

Another common 'non-computing' example of a tree structure is a management organisation chart. Fig 2 is part of a typical example. Again the purpose is to show relations, this time between the various jobs or orders of responsibility within the company.

If you look again at Fig 2 you will notice several things. Most importantly each item on the chart is related to only one item above it. We say that each item has only one parent, ie, Foreman No 1 is responsible only to the Production Team Leader. Similarly the Production Team Leader is only responsible to the Works Manager.

There is no such restriction on the number of 'descendants' that an item may have. The Production Team Leader has many Foremen who have to report directly to him.

In general then, for a structure to be classed as a Tree Structure, each item must have only one Parent but may have none, one or many 'descendants'. The exception to this is the very first item in the tree, this will have descendants but no parent. This first item is given a special name . . . the 'Root' of the Tree.

Before we start considering how these structures can be used in a computing sense we need one more piece of terminology. Each item in a tree is called a 'node'. Thus the first item would be called the 'Root Node' or 'Node 1'. It is helpful to number nodes in this way because it is then easy to discuss particular nodes of a tree diagram. It is then equally easy to find the respective node on the diagram itself.

Binary trees

It may now have occurred to you that one way of describing a 'list' is quite simply that

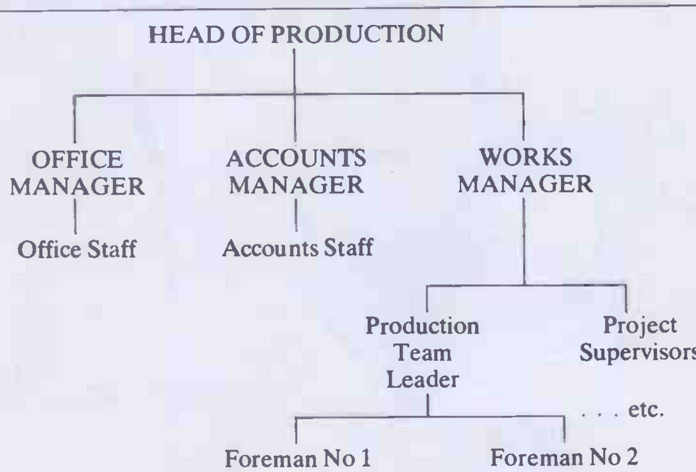


Fig 2

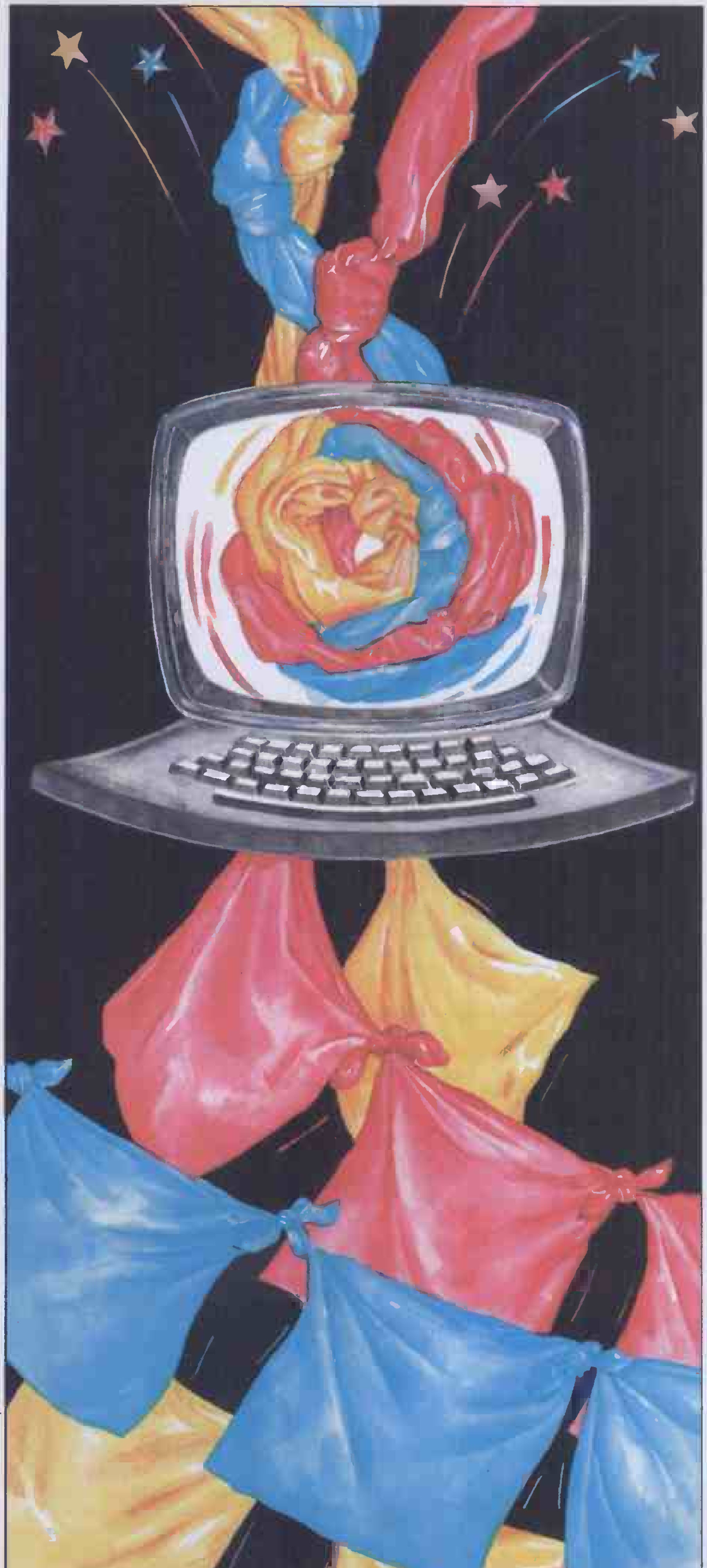


Illustration by Jo Lawrence

it is 'a tree structure in which each parent is allowed only one descendant'. The simplest type of tree structure, other than a list, is one in which we restrict the maximum number of descendants a particular node may have, to two.

Such a structure is called a 'Binary Tree' and it turns out to be a very useful structure indeed. One application of Binary Trees is in the sorting and searching of large amounts of data. Since these applications probably occupy more computer time than any other single application, it is little wonder that a vast amount of work has gone into ways of creating very efficient routines. The complexity of these published standard solutions, many developed and refined over a period of years, tends to cloud the basics and make it extremely difficult for newcomers to come to terms with the more fundamental aspects involved.

By starting with fairly humble beginnings I hope we can avoid these 'apparent complexities' and enable you to see the benefits that exist in using such structures.

Creating a Binary Sort Tree. One prime use of binary trees is in sorting data. Since most micro enthusiasts find sooner or later that elementary sort procedures are absolutely useless for sorting large amounts of data I thought it would be of practical use to consider this application first.

Consider the list of numbers 5,3,1,6,4. We are going to place them onto a tree structure according to the following rule: if the number being added is 'less than or equal to the value of the node being examined' then we shall move to the left descendant. If the number being added is 'greater than the value of the node being examined' then we shall move to the right descendant. When we find that no suitable descendant exists then the number being added to the tree will be added in that vacant descendant position. We shall take the list of numbers in left to right order and this means that the first number 5 becomes the root node. If I go through step by step I am sure you will get the general idea.

5 This is the root node (ie, 1st node)

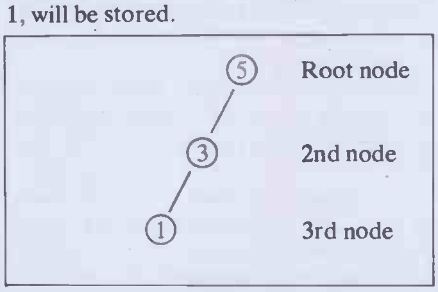
The next number in the list is 3. Since our tree has only one item on it and therefore has no descendants we ask 'is 3 less than or equal to 5?' Since it is less than 5, we shall draw 3 as the left descendant of the root node as follows:

5 Root node

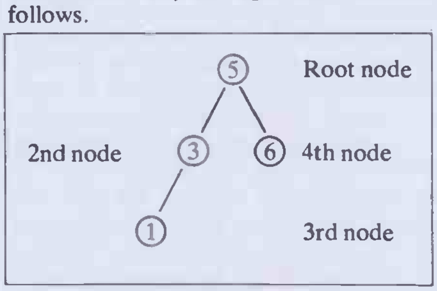
3 2nd node has been drawn as the left descendant

SORT TREES FOR BEGINNERS

The third item in the list is the number 1. To place this in its correct position, according to our rules, we proceed as follows: we compare the new entry, ie, number 1, with the root node. Since 1 is less than the *value* of the root node we proceed to examine the left descendant of the root node which in this case is node number 2 the second item that we added to the tree. We ask 'is the value of the new entry less than or equal to the *value* of node number 2?' Since it is less than the value, we see if node 2 has a left descendant. It hasn't and so this is where our new entry, the number 1, will be stored.

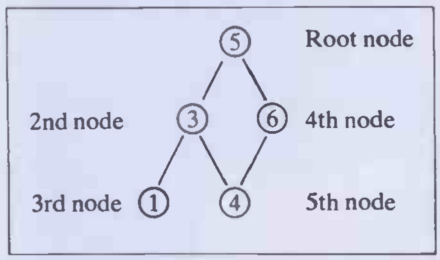


The fourth item in our list is the number 6. We do exactly the same as before and compare this value with the value of the root node. In this case the value is greater than that of the root node value. Since there is not a right descendant of our root node at present we proceed by making our fourth new entry the right descendant as follows.



Make quite sure you are clear about the terminology because I can remember this causing problems myself. The numbering of the nodes themselves is dependent on the order in which we are placing the items onto the tree. When we compare values, in order to ascertain where particular items should be placed, we are interested in the actual *value* that a particular node will have.

Let us place the last item in our list onto our tree. The item is the number 4. We compare the number 4 to the value of the first node in our tree. Since 4 is less than 5 we move to the left descendant of the first node. This is node number 2 which has a value of 3. We ask 'is 4 less than or equal to 3?' Obviously it's not, so seeing that there is not a right descendant of this node we complete our tree by making the last entry the right descendant of node number 2.



You have now created a 'sort tree' and at a first glance you may well be wondering what use such a structure can be. It can be noticed that the leftmost item on the tree is in fact the one with the lowest value. It is also apparent that the rightmost item is in fact the one with the largest value. Other than that there does not appear to be anything special about the arrangement.

Before we continue, try and draw a sort tree for the following list. This time we will consider a list of seven words:
ENGLAND, AMERICA, FRANCE, RUSSIA, SPAIN, GERMANY and CANADA
Use exactly the same rules as we did before only apply them to the alphabetical rather than numeric ordering.

You should end up with the structure as shown in Fig 6.

It is convenient in general to write the value of a node in a circle or rectangle and then in the top right above it put the node number, eg, Node 5 has the value 'SPAIN' in the above example.

If you are still unsure about how to draw a sort tree from a list of numbers or words then write a few of your own lists and draw out their corresponding sort trees. Do it until you are quite clear in your own mind about the processes involved.

Two points should be noted in passing: firstly, it was purely an arbitrary decision to make the 'less than or equal to' decision correspond to the 'left descendants' in the tree. We could equally have used the reverse convention. Secondly, we could have split the decision part into 'less than' and 'equal to or greater than'. Again it was purely arbitrary.

What however was important was that the way we split the decision part enabled us to classify any incoming items into only one of two types. Thus there was never any doubt about the exact position that an incoming item would occupy on an existing tree.

Let us look at two other ways in which we could represent such a tree structure. Firstly we could represent it as a 'Table'. Look at Fig 3, it shows in table form the tree structure that we obtained with our list of numbers:

Node	Data Item	Parent	Left	Right
1	5	0	2	4
2	3	1	3	5
3	1	2	0	0
4	6	1	0	0
5	4	2	0	0

Fig 3

Such a table is easily handled in many high level languages. In Basic, for instance, it would be possible to define an array using statements like DIM T (5,4) if you wished to store the above table. (Obviously you could use the zero'th elements in practice.) In this instance T (n,1) would refer to the n'th nodes value; T (n,2) the node that is the parent of the n'th node; T (n,3) would be the left descendant of the n'th node, etc. We shall look at a Basic program that will produce these type of tables later on.

Another way of representing a tree structure is with a different type of table. This is shown in Fig 4. Supposing that for a tree containing N items we labelled N columns as the Nodes 1,2,3 . . . N; and labelled N rows similarly as the Nodes 1,2,3 . . . N. We could specify that a node, 'p', say, was the Parent of Node 'q', by placing a 1 in the table position (p,q). This type of representation is normally called a 'bit map' or a 'relation matrix'. One advantage of such a description is that it can, by various techniques, be made very compact. Another advantage is that we can use matrix algebra to manipulate the relations. One disadvantage is that to make use of this type of representation you

PARENTS	DESCENDANTS 1	2	3	4	5
1	0	1	0	1	0
2	0	0	1	0	1
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0

This is the bit-map representation of Fig 3
Fig 4

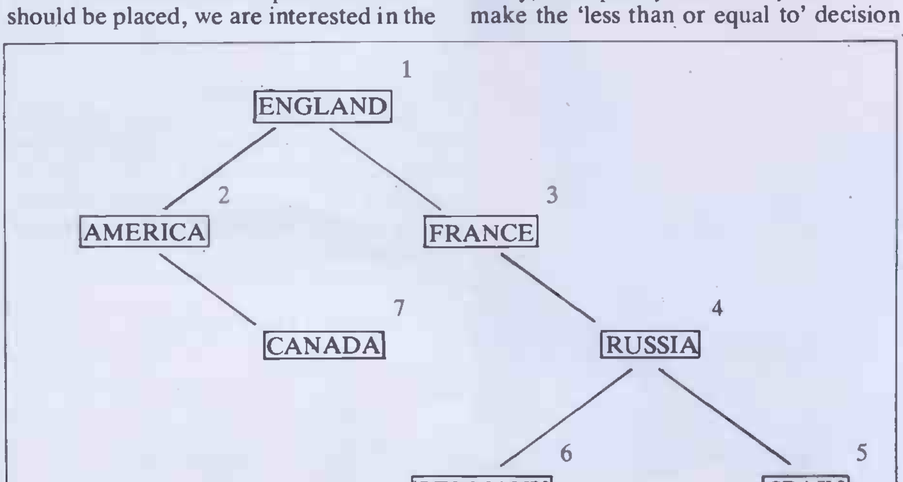


Fig 6

need some quite complex programming — the complexity is nothing to do with the concept of a tree itself; it is a characteristic of this particular way of representing them.

The Relation Matrix representation is not a good way to develop an understanding of the fundamental concepts of tree structures and so we shall not discuss them further in this article.

For most applications of binary trees it is possible to use a table representation, similar to that described earlier.

Building a 'Tree Table'

Now that you have 'worked through' the creation of some simple binary trees and drawn the corresponding table forms, you will appreciate the type of questions that one asks as a tree is built. Firstly, we need to know whether there are any items on the tree at all. If there are not, then all we have to do is make sure that the item being added becomes the 'Root' node. If there are items on the tree already, then we shall have to compare our incoming item in exactly the same way as we did when we were drawing the trees in picture form.

I will use Microsoft's Basic for the examples since it is very popular. I will assume that within the program we shall use a variable called N% to hold the number of items that will be present on our finished tree. I will also use the variable NEW.NODE% to represent the number of the item we are adding. The data items themselves will be placed in a vector variable called DATA.ITEM$().

We shall call the routine 'Create Tree' and we shall write it as a subroutine that can be used as a general utility. The line numbers have been chosen arbitrarily. To place the first item on our 'tree' we simply copy the item into DATA.ITEM$(1). For the second item onwards we must collect the data items and then adjust the necessary tree table pointers. We are implying the existence of a further subroutine that will collect the input item in one element of the vector variable DATA.ITEM$(). The element is specified by the node number held in a further variable which we call NEW.NODE%. The first 'level' of the Create Table subroutine therefore will look like this:

```
490 REM
500 NEW.NODE% = 1:GOSUB 5000' Collect first input item
550 FOR NEW.NODE% = 2 TO N%
560 GOSUB 5000' Collect next input item
580 GOSUB 1000' Store new item on tree
590 NEXT NEW.NODE%
600 RETURN
610 REM
```

We must not forget that we will need to define space for our 'table'. To do this we shall, for the present, assume that somewhere in our finished program we will be using a dimension statement such as the following:

```
DIM DATA.ITEM(N%),
PARENT%(N%)
DIM LEFT.DESCENDANT%(N%),
RIGHT.DESCENDANT%(N%)
```

I am not particularly interested, at the moment, in writing 'compact' code. I simply want to ensure that you can look at the various sections of code and relate them to what we were doing when we were drawing pictures of tree structures earlier. It is for this reason also, that I have chosen variable names that are descriptive.

The building of our 'tree' really starts with subroutine 1000. As yet this is undefined but we do know that the object will be to compare the incoming value with various nodes already on the tree. Since we will always have at least one node in the tree before using subroutine 1000 we will not need to check whether the tree exists or not. Look at the first few lines of subroutine 1000.

(Bear in mind that Basic WHILE/WEND loops and other condition test statements have an implied condition as per standard logic operations in Basic. When we are testing, eg, for WHILE J% <> 0 we do not need to state explicitly the 'not equal to 0' part. We can simply write WHILE J%. I will write these conditions explicitly while looking at the various sections of code.)

```
990  REM
1000 J%=1' We start at the 'Root' node,
       ie, node 1
1010 WHILE J%<>0
1020 IF DATA.ITEM$(NEW.NODE%)
       <= DATA.ITEM$(J%)
       THEN GOSUB 1200 ELSE GOSUB
       1400
1030 WEND
1040 RETURN
1050 REM
```

Notice that we are using a variable J% to identify the position in the tree that we are examining. We compare the current item that is being placed on the tree with node J%. If the *value* of the new data item is 'less than or equal to' the *value* of the node being examined then we must move down to the left descendant of the node being examined. If the *value* of the new data item is greater than the *value* of the node being examined then we will move down to the right descendant of the node being examined. These two alternatives are handled by two separate subroutines as follows:

```
1170 REM___________________________
1180 REM NEW ITEM IS LESS THAN
       OR EQUAL TO VALUE OF
       NODE J%
1190 REM___________________________
1200 IF LEFT.DESCENDANT%(J%)
       <>0 THEN J% =
       LEFT.DESCENDANT%
       (J%):RETURN
1210 PARENT%(NEW.NODE%) = J%
1220 LEFT.DESCENDANT%(J%) =
       NEW.NODE%
1230 J% = ' this forces us to leave WHILE/
       WEND loop in sub 1000
1240 RETURN
1250 REM___________________________

1370 REM___________________________
1380 REM NEW ITEM IS GREATER
       THAN VALUE OF NODE J%
1390 REM___________________________
1400 IF RIGHT.DESCENDANT%(J%)
       <>0 THEN J% = RIGHT.
       DESCENDANT%(J%):RETURN
1410 PARENT%(NEW.NODE%) = J%
1420 RIGHT.DESCENDANT%(J%) =
       NEW.NODE%
1430 J% =0' this forces us to leave WHILE
       /WEND loop in sub 1000
1440 RETURN
1450 REM___________________________
```

Only one or the other of these subroutines will be called during the positioning of a given new item. Let us analyse the one corresponding to 'less than or equal to'. We have already tested the new data item value and the node J% and have found the value of the new item to be 'less than or equal to' the value of the current node that is being examined, ie, node J%. Line 1200 looks to see whether node J% has got a left descendant.

If it has, then we set J% to the value of LEFT.DESCENDANT%(J%) and then return from the subroutine 1200 via the RETURN statement on the same line.

The result of such an action is to return us into the WHILE/WEND loop of subroutine 1000 where again we compare the data item that we are trying to place on the tree with what is now a new node J%. We than repeat the process again and we are, in effect, moving down through the tree in just the same way as we did manually with our pictures.

If the test in line 1200 fails, ie, if there is no left descendant then we know straightaway that our new item is going to become that descendant. We also know that the current node J% is therefore going to be the parent of the new node that we shall create. In cases where the condition test in line 1200 fails we alter the left descendant pointer of node J% (which was zero) to the value NEW.NODE%. We also make node J% the parent of the new.node. Since by this time the new item has been placed on the tree we set J% to zero. By doing this we will automatically leave the WHILE/WEND loop that will still be in operation at the subroutine 1000 level. This will ensure that we fall through this level back to subroutine 500 ready to 'pick up' the next item that is to be placed on the tree.

Subroutine 1400 operates in a similar fashion but concerns itself with those occasions that involve moving to a right descendant.

If we are to retrieve data in ascending order from our tree we must be able to locate the 'lowest value' node that is present. From some of the tree structures that you have drawn you have probably guessed already that all one needs to do is start at the root node and keep going left until we run out of descendants.

We write a subroutine called 'Lowest-node' to do this with a single line of Basic as follows:

```
1420 REM___________________________
2990 LOWEST-NODE-SUBROUTINE
2995 REM___________________________
3000 WHILE LEFT.DESCENDANT%
       (J%)<>0:J% =
       LEFT.DESCENDANT%(J%)
       :WEND:RETURN
3030 REM___________________________
```

We enter the above subroutine with J%

SORT TREES FOR BEGINNERS

as the number of the root node. The lowest value node is returned in J% overwriting the original value. By writing the subroutine in this way we can use it to find the lowest node of a special section of a tree known as a 'subtree'. Consider any tree and then consider a particular node on it, N, say, as being the root of a smaller tree. That smaller tree is the subtree of node N. We also talk about 'left' and 'right' subtrees. These are the subtrees formed by considering, respectively, the left and right descendants of a node as root nodes.

Before we can construct a program using these routines we must consider one last problem. Given a particular node we want to be able to find the node that is next in ascending order and print it. To do this we do *not* have to consider any of the values of the data items themselves because the order can be deduced from the parent, left descendant, right descendant pointers that our 'Create Table' subroutine has provided.

If you consider some drawn examples you will convince yourself that any subtree formed using the right descendant of a particular node N will only contain values greater than the value of node N. If we search this subtree for the node of lowest value we will have found the item that is next in order. Remember that we have already developed a subroutine to search a tree for the lowest value and we will be able to use this to search our subtrees as well.

It is possible, of course, that the current node being examined will not have a right descendant. If this is the case we must move up to the parent of the current node and repeat the process but, if we are moving up from a right descendant we must ignore this parent and move up again because the node will already have been printed. If during this 'climbing back' we find ourself at the root node then we will have printed all the nodes in the tree.

It is very helpful to relate these ideas to diagrams of various trees. Draw various subtrees in different colours, etc, and work through the above ideas on paper. As you develop a mental picture of how we are selecting the next item to print you will find the coding easier to follow.

The essential details of 'Next-node' are as follows: we look at the current node and ask 'is there a right descendant?' The coding is done like this:

```
3090 REM____________________
3100 IF RIGHT.DESCENDANT%(J%)
     <>0 THEN GOSUB 3200 ELSE
     GOSUB 3300
3110 RETURN
3120 REM____________________
```

Corresponding to the two possibilities we choose between two subroutines.

If there is a right descendant then we move to it and then we use 'Lowest-node' to find the lowest valued node of this right subtree as follows:

```
3190 REM____________________
3200 J%=RIGHT.DESCENDANT%
```

```
2    REM________________________________________________
3    REM          SET-UP-BLOCK
4    REM________________________________________________
5    CLEAR:WIDTH LPRINT 70:INPUT"How many items do you wish to
     store";N%
10   DIM DATA.ITEM$(N%),PARENT%(N%),LEFT.DESCENDANT%,
     (N%), RIGHT.DESCENDANT%(N%)
25   REM________________________________________________
30   GOSUB 500' Build Tree Table
32   REM________________________________________________
33   REM          PRINT-TABLE
34   REM________________________________________________
35   LPRINT"Tree Table has been created as. . .":LPRINT
37   LPRINT"NODE","DATA ITEM","PARENT","LEFT","RIGHT"
40   FOR I% = 1 TO N%
50       LPRINT I%,DATA.ITEM$(I%);:
55       LPRINT TAB(30) PARENT%(I%),LEFT.DESCENDANT%(I%),
         RIGHT.DESCENDANT%(I%)
60   NEXT I%
80   REM________________________________________________
90   REM          PRINT-DATA-IN-ORDER
100  REM________________________________________________
105  LPRINT:LPRINT"Order list is as follows. . . ":LPRINT
110  J%=1:GOSUB 3000' Lowest-node
115  EXIT.FLAG%=1
120  WHILE EXIT.FLAG%
130      LPRINT DATA.ITEM$(J%),:GOSUB 3100' Next-node
150  WEND
160  END' . . . Logical End of Program
460  REM________________________________________________
470  REM          CREATE-TABLE-SUBROUTINE
480  REM________________________________________________
500  NEW.NODE%=1:GOSUB 5000' Input data item
550  FOR NEW.NODE%=2 TO N%
560      GOSUB 5000' Input data item
570      GOSUB 1000' 2nd level of this routine
580  NEXT NEW.NODE%
590  RETURN
1000 J%=1
1010 WHILE J%
1020     IF DATA.ITEM$(NEW.NODE%)< = DATA.ITEM$(J%) THEN
GOSUB 1200 ELSE GOSUB 1400
1030 WEND
1040 RETURN
1200 IF LEFT.DESCENDANT%(J%) THEN J% =
     LEFT.DESCENDANT%(J%):RETURN
1210 PARENT%(NEW.NODE%) = J%:LEFT.DESCENDANT%(J%) =
     NEW.NODE%:J%=0:RETURN
1400 IF RIGHT.DESCENDANT%(J%) THEN J% =
     RIGHT.DESCENDANT%(J%):RETURN
1410 PARENT%(NEW.NODE%) = J%RIGHT.DESCENDANT%(J%) =
     NEW.NODE%:J% = 0:RETURN
1420 REM________________________________________________
2990 REM          LOWEST-NODE-SUBROUTINE
2995 REM________________________________________________
3000 WHILE
     LEFT.DESCENDANT%(J%):J%=
     LEFT.DESCENDANT%(J%):WEND:RETURN
3030 REM________________________________________________
3080 REM          NEXT-NODE-SUBROUTINE
3090 REM________________________________________________
3100 IF RIGHT.DESCENDANT%(J%) THEN GOSUB 3200 ELSE GOSUB 3300
3110 RETURN
3200 J%=RIGHT.DESCENDANT%(J%):GOSUB 3000' Lowest-node
3220 RETURN
3300 IF J%=1 THEN EXIT.FLAG%=0:RETURN
3310 OLD.J%=J%:J%=PARENT%(J%):IF RIGHT.DESCENDANT%(J%) =
     OLD.J% THEN GOTO 3300
3320 RETURN
3330 REM________________________________________________
4980 REM          INPUT-SUBROUTINE
4990 REM________________________________________________
5000 INPUT"Enter value to be stored ";DATA.ITEM$(NEW.NODE%):RETURN
5010 REM________________________________________________
```

Tree Table has been created as:

NODE	DATA ITEM	PARENT	LEFT	RIGHT
1	PAUL	0	2	3
2	ANDY	1	6	4
3	RUTH	1	12	28
4	GEORGE	2	9	5
5	MABEL	4	7	39
6	AMANDA	2	8	35
7	JENSINE	5	10	11
8	ALBERT	6	0	0
9	FRANK	4	15	14
10	IAN	7	31	21
11	JOSEPH	7	13	20
12	PETER	3	0	19
13	JOHN	11	38	0
14	FRED	9	0	0
15	CYRIL	9	16	18
16	CHRIS	15	22	17
17	CHRISTINE	16	0	0
18	DAVE	15	0	25
19	RONALD	12	33	29
20	KEVIN	11	26	0
21	JANICE	10	37	0
22	ANNE	16	23	24
23	ANN	22	0	0
24	CAROLINE	22	34	0
25	DAVID	18	0	0
26	JOYCE	20	0	27
27	JUDY	26	0	30
28	WENDY	3	40	0
29	RUSS	19	0	0
30	JULIE	27	0	32
31	HAROLD	10	0	0
32	KAY	30	0	0
33	ROBERT	19	0	36
34	BOB	24	0	0
35	ANDREAS	6	0	0
36	ROLF	33	0	0
37	JACK	21	0	0
38	JILL	13	0	0
39	MAUREEN	5	0	0
40	SANDRA	28	0	0

Ordered list is as follows:

ALBERT	AMANDA	ANDREAS	ANDY	ANN
ANNE	BOB	CAROLINE	CHRIS	CHRISTINE
CYRIL	DAVE	DAVID	FRANK	FRED
GEORGE	HAROLD	IAN	JACK	JANICE
JENSINE	JILL	JOHN	JOSEPH	JOYCE
JUDY	JULIE	KAY	KEVIN	MABEL
MAUREEN	PAUL	PETER	ROBERT	ROLF
RONALD	RUSS	RUTH	SANDRA	WENDY

Fig 5

```
    (J%):GOSUB3000'Lowest-node
3220 RETURN
3230 REM
```

If a right descendant does not exist we have to move up the tree. We keep track of the previous value of J% so that we can check whether we have moved upwards from a right descendant. This is how we do it:

```
3290 REM
3300 IF J% = 1 THEN EXIT.FLAG% =
     0:RETURN
3310 OLD.J% = J%:J% = PARENT%
     (J%):
     IF RIGHT.DESCENDANT%(J%)
     = OLD.J% THEN GOTO 3300
3320 RETURN
3330 REM
```

The completed subroutine can be seen in the listing of the example program where the above sections of code have been combined into a single block entitled 'Next node'.

A typical program

We have developed three fairly simple subroutines that enable us to:

a) Build a table corresponding to a tree structure.
b) Find the lowest node of a tree or subtree.
c) Find the next node in ascending order.

I have combined these subroutines into a short program that does the following:

a) Builds a tree table using input from the terminal.
b) Prints the table, using a simple loop, so that you can examine it.
c) Prints the input data in ascending order using calls to 'Lowest node' and to 'Next-node'.

I have written some of the ideas that we have discussed as multiple line statements. Implied tests, eg, WHILE J%, rather than the explicit WHILE J% <>0, have also been used to shorten some of the lines of code. Fig 5 shows an example of the output that the program provides.

A final word

If you have not used 'tree sorts' before then the speed of these routines will be very impressive. Of particular interest is that we achieve the sorting without physically rearranging any of the data items by using pointers to specify the logical structure of the corresponding tree.

My decision to use the 'Parent' pointers needs a certain justification. Those of you who have come across these types of sorts before will be aware that it is standard practice to eliminate the parent pointers thus saving 33% of the total pointer space. It is also common practice to use recursion to provide some very elegant routines. These and other refinements such as relation matrix representation, when considered collectively, do a great job at hiding the essential simplicity of the fundamental concepts.

Those of you that have found the ideas straightforward may like to consider how the parent pointers can be eliminated. Look at the coding for the subroutines 'Lowest node' and 'Next node'. There is only one place that we actually use the parent pointers (program line 3310). If, within these two routines, we created a list of nodes that we encounter as we climb down a tree then we could climb back up by reading the list backwards. In this case we would only need to create left and right pointers in our table. Such space saving becomes increasingly more important as the size of the data set with which we are dealing increases. END

APPLES AND PAIRS
STRUCTURED BASIC FOR THE APPLE

Dr Andrew Bangham reports on U-microcomputers' Basic enhancement software for the Apple II.

Why should one progress to a more structured language? What is wrong with Applesoft or indeed any other Basic? Certainly Applesoft is considerably better than older Basics. No-one would stand a chance selling a micro which only offered a minimal Basic today. The problem is that large or subtle Applesoft programs are difficult to follow, particularly when six months old, partially forgotten or when they were originally written by someone else. The problem is well known, so why not use Pascal, after all it only costs a few hundred pounds to put UCSD Pascal into an Apple? The puritanical argument that you should buckle down and learn a proper language like Pascal even if you already know Basic which is 'not a proper language' is nonsense. A major reason for using Basic is that it is interpreted. You can write something, try it and alter it in less time than it takes to load the UCSD editor, let alone use it. Furthermore, the ability to print out values of variables after a crash is a very powerful debugging tool. These are powerful reasons for sticking to the familiar but there is another. For another often quoted disadvantage of Basic, that it is not properly standardised, also proves to be a virtue. Without standardisation Basic comes in many varieties; the good ideas win, the bad die out and Basic evolves. Structured Basic interpreters have been around for a time now, and since they are a 'good idea' they are sticking. Now U-microcomputers has produced the extra commands needed to structure Applesoft programs without having to learn a whole new language. I have used it for three months and am all in favour!

The persuasion problem

An initial problem is how to present the case for using a structured language clearly, so that a beginner can make a rational decision on whether to invest the necessary time and money to change. Of course the change is a small one compared to a change to Pascal but a beginner only writes or copies small programs with the help of verbal or written prose and will not necessarily encounter those circumstances in which a more structured language is dramatically better than any other. Once familiar with Basic a programmer will naturally find it easier to continue with it rather than change, as any other new language will have an unfamiliar vocabulary and syntax. Furthermore, it is easy to be sidetracked by Fortran IV to which Basic bears a family resemblance and become convinced that because a large number of professional computer users use Fortran and it is unstructured, structuring is unnecessary. If you are tempted to use Fortran IV first take a Fortran subroutine and try and write down exactly how the algorithm works, in sentences. If it is difficult you will need no further convincing. If not, assume for the moment that a structured language is a *good thing* and that the easiest one for an existing Apple Basic programmer to use is structured Basic. I shall attempt to illustrate structured Basic by using a short example.

Examine the 'standard' Basic subroutine in Listing 1. It could have come from a statistical package, but what part? See if you can tell what it is doing. This sort of problem will not, of course, occur when you look at any of your friends', or colleagues', programs since they are always well documented, but problems of documentation do occur in the big, wide world. Notice how many GOTOs there are. Can you see the flaw? If the user asks to start again (pressing S), why does the program not produce the correct 'means'?

Fortunately, Applesoft does allow some structuring. Compare the 'standard' Basic program in Listing 1 with an Applesoft version given in Listing 2. By putting more than one statement on one line we can avoid several GOTOs. The meaning gets clearer; look at lines 50 and 80 and you can see what happens when the random number X takes values less than p, a counter NP is incremented and the STAR$ string is loaded with star. Similarly when X is more than p, but what is the mistake? Does it jump out a mile? Compare it with Listing 1. Furthermore, it is still not clear how the program loops, the reader must carefully go through the entire program and methodically find all the GOTOs and (usually) pencil in exactly where they go to, all of which can be a major problem for a big program.

Now look at Listing 3. There is a new command, REPEAT — UNTIL. This is a loop command rather like FOR — NEXT. The block of program between the two parts is repeated until an expression is true.

```
10 REPEAT
20 K=K+1:PRINT K
30 UNTIL K=5
```

This little example will continue to print K until K is 5, utterly explicit. Notice that (as with a FOR — NEXT loop) the condition is placed at the end of the loop, but notice that the condition for repeating can be the result of any logical operation, for example:

```
10 REPEAT
20 PRINT 'TESTING'
30 INPUT A$
40 UNTIL A$='Q'
```

In Listing 3 it is clear from the outset that certain blocks of program are to be repeated, and why? The conditions for returning to line 10 are well laid out making it clear that to start again we should include line 10. Programs 1 and 2 mistakenly went to line 20 instead.

In Listing 3 lines 50 to 85 have been further improved by using the IF — THEN — ELSE — ENDIF expression. It is now quite obvious that either NP or NQ will be incremented depending on the value of X. It is also clear that there was a mistake in Listing 2 (though not Listing 1). In Listing 2 neither of the two IFs allow for the possibility of X=P, so under some conditions NP+NQ will not equal the total number of random numbers (trials) generated. Listing 3 also makes it clear how the user should quit the program.

What does the program do in words? It generates numbers according to the binomial distribution. It asks for the probability 'P' of a successful event occurring, for example, the probability P of a tossed coin landing heads is 0.5. Then it uses the random number generator to simulate coin tossing. Heads it is less than P (a success), and the number of heads is counted using NP, and tails if greater than or equal to P, counted using NQ. After each toss the average number of heads (mean) is printed and the keyboard is checked to see if a key has been pressed. If an S was pressed the program repeats (starts again). If a Q was pressed it quits, otherwise it repeatedly

```
10 NP = 0
20 NQ = 0
30 INPUT "VALUE FOR
     PROBABILITY ";P
40 X = RND (1)
50 IF X < P THEN 80
60 NQ = NQ + 1
70 STAR$ = " "
75 GOTO 100
80 NP = NP + 1
90 STAR$ = "*"
100 MEAN = NP / (NP + NQ)
110 PRINT "MEAN=";MEAN
120 KY% = PEEK ( - 16384) - 128
130 POKE - 16368,0
140 IF CHR$ (KY%) = "S" THEN 20
150 IF CHR$ (KY%) = "Q" THEN 170
160 GOTO 40
170 END
```

Listing 1

'flips coins'.

Suppose we wanted to extend the program to plot the mean each time around the inner loop. In Applesoft we would normally GOSUB to a plotting subroutine. To be neat the plotting routine would have to check that the coordinates were within the Applesoft plotting ranges and it would have to offset the x and y axes to suitable places on the screen. It is irritating to have y=0 at the top left and much more convenient to have it just above the four lines of text below HGR1. Of course the program should also lay out a tickmarked axis. Instead of writing these frequently used subroutines, how much more convenient it would be if we had them on disk in a library and could 'merge' them in instantly.

Subroutines

To use axis drawing and plotting routines written at some other time for some other program, we would normally have to renumber them, merge them and finally, but most awkwardly, ensure that all the variable names are compatible. These apparently minor problems are overwhelming and usually make it easier to start again. How much easier it would be to use a special sort of subroutine, a procedure, instead.

Two suitable procedures are shown in Listing 4. Neither was written especially for this example. They came from a library of procedures built up since we started using structured Basic. To use the plotting procedure PLTT we merely have to add the line

50 DO DPTT,(NP+NQ),MEAN*100,4

and it will be automatically loaded from disk with suitable line numbers (if not already in memory) then executed. The values to be plotted (NP+NQ) on the x axis and (Mean*150) on the y axis are passed directly to the procedure according to their *position* after the DO PLTT command. All the variables mentioned on the first line of the procedure declaration (line 230) are local variables. They are used within the procedure but will not interfere with variables of the same name used anywhere else in the program (see below). Easy and elegant.

Likewise with the axis drawing routine. Simply DO AXS and the axis drawing routine is loaded into memory (from disk if not already in memory) and executed. Listing 4 shows the completed program. Notice that as there are no GOTOs and no GOSUBs there are no references to line numbers anywhere in the program making it easier to relocate procedures as they are loaded with a DO statement.

The advantages of procedures which can be automatically loaded from disk are enormous, particularly as it is relatively easy to prevent variable names clashing.

Summary

The U-microcomputers' structured Basic is supplied on disk. It will run on both the Apple II and Apple IIE. To load the structured Basic interpreter, RUN BOOT BASIC. Once loaded Applesoft programs can be run in the usual fashion except that the RUN command has been replaced by DRN (disk run) and BRUN has been replaced by DBRN, also IF statements will have to be modified. There are one or two other exceptions described below but the only other important comment to make at this stage is that the programs are loaded further up in memory than usual (the structured Basic interpreter resides at the bottom of memory), and you may have to use the START = 16384 instruction to keep clear of HGR1 (see below).

Procedures already saved on disk can be loaded by DOing them in immediate mode. For example,

DO AXS

will cause the structured Basic interpreter to look for the procedure called AXS in memory, if not there it will search the disk as well. It will either look at the boot drive or the one selected using the

DISK=slot,drive command.

Conversely, procedures already in memory can be PSAVEd individually by name even when several are in memory at once.

PSAVE AXS

will save the procedure named axis in a file called PROC.AXS. In fact one can operate on individual procedures rather easily. The procedures in memory can be identified by

LOCATE

which lists the procedures by name, together with their line numbers. Any one procedure can be listed using, for example,

LIST AXS

Procedures can be USEd as well as DOne. USE behaves exactly as DO, except that once the procedure has been executed it is forgotten, leaving the memory free for other things. A neater, easier way of chaining than chaining itself. Incidentally arrays can also be cleared from memory (without losing other variables) by using the ERASE array name command. So, an infrequently used procedure which needs additional working array space can be loaded, executed and completely removed without disturbing the rest of the program.

The relocatable nature of this structured Basic means that GOTOs and GOSUBs should not be used. Instead, there are a variety of more powerful commands for branching and looping instructions augmenting and replacing IF — THEN and FOR — NEXT. The first is replaced by

IF *expression* THEN do something
ELSE: do an alternative
ENDIF which terminates the IF statement.

Any number of lines can lie between the alternatives and the ELSE is optional. The *expression* is evaluated exactly as with ordinary Applesoft, the result being either true or false. There is another form of this instruction.

IF *expression* 1, *expression* 2, *expression* 3...etc
CASE: it does this block if expression 1 is true
CASE: execute this when expression 2 is true
CASE...
ELSE optional
ENDIF

The FOR — NEXT loop is augmented by

REPEAT
UNTIL *expression* is true

which allows a block of program to be repeated, the condition being tested at the end of the block.

WHILE *expression* is true
ENDWHILE

checks the condition at the beginning of the loop. This is particularly useful in Applesoft since the FOR — NEXT loop is always executed at least once. All these loops must be exited using the proper condition expression. For example, (as in ordinary Applesoft), to exit from a FOR — NEXT early one must tamper with the counter

```
10 FOR K=1 TO 10
20 PRINT "K=";K
30 INPUT "Q TO QUIT ";A$
40 IF A$="Q" THEN K=20
50 NEXT
```

Likewise, one must exit from this loop properly.

```
10 REPEAT
20 K=K+1
30 PRINT "K=";K
40 INPUT "Q TO QUIT ";A$
50 UNTIL A$="Q" OR K> 10
```

The usual ONERR GOTO command is replaced by a line number independent version;

ONERR

If an error occurs in this part of the program

```
 10 NP = 0
 20 NQ = 0
 30 INPUT "PROBABILITY ? ";P
 40 X = RND (1)
 50 IF X < P THEN NP = NP + 1:STAR$
    = "*"
 80 IF X > P THEN NQ + 1:STAR$ = " "
100 MEAN = NP / (NP + NQ)
110 PRINT "MEAN=";MEAN;STAR$
120 KY$ = CHR$ ( PEEK ( - 16384))
130 POKE - 16368,0
140 IF KY$ = "S" THEN 20
150 IF KY$ = "Q" THEN 170
160 GOTO 40
170 END
```

Listing 2

```
  5 REPEAT
 10 NP = 0
 20 NQ = 0
 30 INPUT "PROBABILITY ? ";P
 35 REPEAT
 40 X = RND (1)
 50 IF X < P THEN NP = NP + 1:STAR$
    = "*"
 80 ELSE :NQ = NQ + 1:STAR$ = " "
 85 ENDIF
100 MEAN = NP / (NP + NQ)
110 PRINT "MEAN=";MEAN;STAR$
120 KY$ = CHR$ ( PEEK ( - 16384))
130 POKE - 16368,0
140 UNTIL (KY$ = "S") OR (KY$ =
    "Q")
150 UNTIL KY$ = "Q"
170 END : REM
```

Listing 3

APPLES AND PAIRS

then . . .
ERRSTART
Do this bit
ERREND

In addition to the commands affecting the fundamental structure of Applesoft programs, U-microcomputers has thrown in some useful ones which clear up some annoying PEEKs and POKEs affecting the screen display. For example, GRAPH-MODE which is equivalent to POKE −16304,0 which selects a graphical display mode, PAGE which selects page 1 or 2 graphics or text pages equivalent to POKE −16299,0. The complete list is:

GRAPH MODE	equivalent to POKE =	−16304,0
TEXT MODE	equivalent to POKE	−16303,0
MIXED	equivalent to POKE	−16301,0
FULL	equivalent to POKE	−16302,0
PAGE 1	equivalent to POKE	−16299,0
PAGE 0	equivalent to POKE	−16300,0
LORES	equivalent to POKE	−16298,0
HIRES	equivalent to POKE	−16297,0

SCREEN will direct hi-res graphics to 0 (page 1) or 1 (page 2) even if that screen is not being displayed. It is equivalent to manipulating memory location $ . . . .
FILL WITH colour fills the screen with the selected colour. SUPERIMPOSE simply copies hi-res screen 1 onto hi-res screen 2.

Criticisms

To understand the disadvantages of this structured Basic interpreter, we must first understand how it works. Whenever you type DO, for example, the structured Basic interpreter converts it to & plus control R. Now the ampersand is an instruction that Applesoft does recognize. It is an instruction which Apple wisely included in the Applesoft interpreter which allows this sort of 'patching' by forcing Applesoft to jump through a vector at $3FA to the patched command. Apple used it for their programmers' assistant package APA. If you load and list a structured Basic program without having loaded the interpreter first, you will see the ampersand. If you first invoke the APA &Show option which allows control characters to show up in inverse video, then you will also see the control R. Each structured Basic command has its own ampersand, plus character sequence, given in the manual. The structured Basic interpreter traps these during LISTing and substitutes the appropriate structured Basic command.

The main disadvantage of the structured Basic interpreter is that other programs which use the & command may not work, APA, for example. The many advantages of relocatable procedure have been dwelt on in previous paragraphs, but there is a disadvantage with changing line numbers, namely that you lose contact with where things are in a program. Instead one has to rely on remembering the context in which things occurred. To 'find' things in context one needs a FIND command, preferably one which can FIND and REPLACE globally. It is a pity that no find command was included in this version of Basic. Unfortunately our favourite co-resident editor (it sits above HIMEM) is now difficult to access since it also used an ampersand command. Now it has to be accessed rather awkwardly by a CALL to its address.

```
  5 REPEAT
 10 NP = 0
 20 NQ = 0
 25 DO AXS
 30 INPUT "PROBABILITY ? ";P
 35 REPEAT
 40 X = RND (1)
 50 IF X < P THEN NP = NP + 1:STAR$
    = "*"
 80 ELSE :NQ = NQ + 1:STAR$ = " "
 85 ENDIF
100 MEAN = NP /(NP + NQ)
107 DO DPTT, NP + NQ,MEAN * 100,4
110 PRINT "MEAN=";MEAN;STAR$
120 KY$ = CHR$ ( PEEK ( - 16384))
130 POKE - 16368,0
140 UNTIL (KY$ = "S") OR (KY$ =
    "Q")
150 UNTIL KY$ = "Q"
170 END : REM


180 PROCEDURE AXS;OX,OY,LX,
    LY,X,Y
185 HGR : HCOLOR= 3
190 OX = 5:OY = 155
195 LX = 200:LY = 150
200 HCOLOR= 3
205 HPLOT OX,OY TO OX + LX,OY:
    FOR X = OX TO (OX + LX) STEP
    LX / 10: HPLOT X,OY - 1: NEXT :
    HPLOT OX + LX / 2,OY - 2
210 HPLOT OX,OY TO OX, OY - LY:
    FOR Y = OY TO (OY - LY) STEP
    - LX/ 10: HPLOT OX + 1,Y: NEXT
    : HPLOT OX + 2,OY - (LY / 2)
215 HPLOT OX,OY - LY TO OX +
    LX,OY - LY TO OX + LX,OY
220 FINISH


230 PROCEDURE DPTT,XP,YP, SH
235 REM DRAW SHAPE SH AT
    XP,YP
240 REM WHEN SH=5THEN HPLOT
    TO
245 REM SH=1 CIRCLE, SH=2
    CROSS, SH=3 DIAMOND,
    SH=4DOT
250 IF SH < 1 OR SH ‹ 5 THEN PRINT
    "WARNING SH OUT OF RANGE
    ": STOP : ENDIF
255 IF XP < - 5 THEN XP = - 5: ENDIF
260 IF XP > 205 THEN XP = 205:
    ENDIF
265 IF YP < - 5 THEN YP = - 5: ENDIF
270 IF YP > 155 THEN YP = 155:
    ENDIF
275 IF SH < 4,SH = 4
280 CASE
285 DRAW SH AT 5 + XP,155 - YP
290 CASE
295 HPLOT 5 + XP,155 - YP
300 ELSE
305 HPLOT TO 5 + XP,155 - YP
310 ENDIF
315 FINISH
```

Listing 4

A more subtle complication arises when you use the EXEC command. For example, if you EXEC a LIST command, structured Basic will not interpret the ampersands. Again this is a pity because with structured Basic one tends to collect a whole series of procedures on disk. It would be nice to list them, one after another, without having to sit around loading and listing them individually. Exactly the situation to use a 'macro', by generating a text file full of LIST FILENAME commands, then EXECing them and going for a coffee.

So far I have been unable to use the Apple hi-res character generator with it, though it is not clear why not.

The structured Basic interpreter resides in the bottom of memory, the area in which your program would normally sit, actually from $800 to $1D00. Your program therefore starts at $1D00. That is very, very close to HGR1, indeed it is rather close to HGR2. For many programs which use graphics it will either be necessary to force variables to be stored above the graphics page or, perhaps better, force both your program and the variables to be stored above graphics page 1. There are two ways to do this: use the structured Basic utility START=16384 followed by a NEW statement, or change two memory locations. Easily done from the monitor. Type M/C (this structured Basic utility is equivalent to CALL −151 (page 40 of the Apple reference manual)), then, alter location *68:40 (the low byte *67 is already 01) which directs the machine to store user programs starting at $4001, just above graphics page 1. See page 141 of the green Applesoft manual. One must also ensure that the program area starts with $00 so *4000:00 makes quite sure. Jump back into Basic by typing control-C return and any program you once had will have gone, but any program you type or load will start above graphics page 1. This arrangement leaves a reasonable amount of memory for your program, $9D00 − $4000 = $5D00 bytes, compared to $4000 − $800 = $3800 bytes which is usually available below graphics page 2. Since it is so easy to USE procedures effectively doing a CHAIN, one can manage with less memory than with Applesoft itself.

One annoying aspect of this structured Basic is that you must include a FINISH statement somewhere after every PROCEDURE NAME declaration otherwise you cannot even LIST the program. So, if you inadvertently delete a FINISH, you cannot then LIST the program to see where a new one should go. You must resort to putting one on the line after the PROCEDURE NAME (hoping that there was nothing there already), then listing to see where it should have gone and move it. We cannot escape from this 'annoying' paragraph without a general comment on manuals. Why no index? Just because most wordprocessing packages (not mentioning WordStar by name) do not include an indexing facility, does not mean indexes are unnecessary. They always were but now with the advent of

GOTO page 243

NEWCOMERS START HERE

This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. *While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!*

Probably the first thing you noticed on picking up this magazine for the first time was the enormous amount of unintelligible-looking jargon. Well, in the words of *The Hitch-hikers' Guide to the Galaxy*, don't panic! Baffling as it may sound, the jargon does actually serve a useful purpose. It's a lot easier to say VDU, for example, than 'the screen on which the computer's output is displayed'. This guide is intended to help you find your way around some of the more common 'buzzwords' you're likely to come across in the pages of *PCW*.

For those completely new to computing, let's start with the question: what is a microcomputer? We can think of a micro as a general-purpose device as opposed to a typewriter which can only be used for typing, a calculator to perform calculations, a filing-cabinet to file information and so on. A micro can do all those things and more.

If it is to be of any use, a general-purpose device needs some way of having a function assigned to it. We do this by giving the computer a set of logical instructions called a **program**. The general term for computer programs is **software**. Every other part of a microcomputer system is known as **hardware**. 'If you can touch it, it's hardware.'

Programs must be written in a form the micro can recognise and act on — this is achieved by writing the instructions in a code known as a **computer language**. There are literally hundreds of different languages around, the most popular of these being **Basic**. Basic is an acronym of Beginners' All-purpose Symbolic Instruction Code. Although originally intended only as a simple introductory language, Basic is now a powerful and widely-used language in its own right.

Other languages you're likely to come across in *PCW* include **Forth, Pascal, C** and **Comal**. These are known as **high-level languages** because they approach the sophistication of a human language. You'll also see references to the **low-level languages, assembly language** and **machine code**. We'll look at high and low-level languages in a moment.

The heart of a micro, the workhorse, is the **processor** or **Central Processing Unit (CPU)**. The processor usually consists of a single silicon chip. As with computer languages, there are a number of different types of processor around, the Z80, 6502 and 8088 being the three most common. The processor is nothing magical — it's just a bunch of electronic circuits. It's definitely not a 'brain'.

Being electronic, the processor's circuitry can be in one of two states: on or off. We represent these two states by **binary** (base two) notation, the two binary digits (known as **'bits'**) being 0 and 1. It is possible to program computers in binary notation, otherwise known as **machine code** (or machine language) programming.

Machine code is called a low-level language because it operates at a level close to that 'understood' by the processor. (Languages like Basic are known as high-level languages because they are symbolic, operating at a level easily understood by people but not directly understood by the processor.)

Between high-level languages and machine code is a low-level language known as **assembly language** or, colloquially, **assembler**. This is a mnemonic code using symbols which the processor can quickly convert to machine code.

Since there is no binary equivalent of a comma or the letter 'a', for example, we need some sort of code to represent each character to be processed by the computer. In order to simplify communication between computers, a number of standard codes have been agreed on. The most widely used of these codes is the American Standard Code for Information Interchange, **ASCII**. This system assigns each character a decimal number which the processor can then convert to its binary equivalent.

There are two types of program to do this translation for us. The first of these is a **compiler** which translates our whole program permanently into machine code. When we compile a program, the original high-level language version is called the **source code** while the compiled copy is called the **object code**. Compiled programs are fast to run but hard to edit. (If we want to change a compiled program, we either have to edit it in machine code (extremely difficult) or we have to go back to a copy of the source code.) For this reason there is a second translation program: an **interpreter**. An interpreter waits until we actually run (use) the program, then translates one line at a time into machine code — leaving the program in its original high-level language. This makes it slower to run than a compiled program, but easier to edit.

There are two strange-sounding Basic words you're likely to come across: **POKE** and **PEEK**. When you program in a high-level language, you are normally unable to choose which part of the machine's memory the processor will use to store things. This makes programming easier as you don't need to worry about memory locations, but slows down the program since the processor has to 'look up' addresses for you. Using the POKE command, however, you can 'POKE' a value directly into a desired memory address. 'POKE 10000,56', for example, puts the value 56 into memory location 10000. PEEK allows you to examine the content of a particular memory address. If you were to follow the above POKE with 'PEEK 10000', the computer would respond by displaying the value 56. (POKEing and PEEKing is normally done to increase program speed. It's a compromise between Basic and machine code.)

So far, we have a processor and a program. Since a computer needs somewhere to store programs and data, it needs some kind of memory. There are two types of memory known as **Read Only Memory (ROM)** and the badly-named **Random Access Memory (RAM)**. ROM is so-called because the processor can **'read'** (get things out of) its contents, but is unable to **'write to'** (put things in) it.

ROM is used to store firmware, which consists of software permanently available on the machine. An interpreter is a typical example of firmware (stick with it: it gets easier!).

RAM differs from ROM in two important ways. Firstly, you can write to it as well as read from it. This means that the processor can use it to store both the program it is running and data (information). The second important difference is that RAM needs a constant power-supply to retain its contents: as soon as you switch the computer off, you lose your program and data.

Memory is described in terms of the number of characters we can store in it. Each character is represented by an 8-bit binary number. 8 bits make one byte and 1024 bytes make one **kilobyte** or **1k**. 32k, for example means that the computer can store about 32000 characters in its memory. If 1024 sounds like an odd number, remember that everything is based on the binary system, thus 1,2,4,8,16 ... 1024 being the nearest binary multiple to 1000.

There are numerous forms of **permanent or backup** storage, but by far the most common are the **floppy disk** and **cassette**.

Floppy disks or diskettes are circular pieces of thin plastic coated with a magnetic recording surface similar to that of tapes. The disk, which is enclosed in a protective card cover, is placed in a **disk drive**. Disk drives comprise a high-speed motor to rotate the disk and a read/write head to record and 'playback' programs and data.

The disk is divided into concentric rings called **tracks** (similar to the tracks on an LP) which are in turn divided into small blocks by spoke-like divisions called **sectors**.

There are two methods for dividing the disk into sectors. One method is called **hard-sectoring**, where holes punched in the disk mark the sectors, and the other is soft-sectoring where the sectors are marked magnetically. (The reason that disks from one machine can't be read by a different make is that each manufacturer has its own way of dividing up the disk. Recently, however, manufacturers do seem to have begun to acknowledge that this situation can't go on forever, and they are working on making their disks compatible with each others.')

Since the computer needs some way of tracking the whereabouts of everything on the disk, we have a program called a **Disk Operating System**, more usually known simply as the **Operating System (DOS or OS)**. The operating system does all the 'house-keeping' of the disks, working out where to put things, letting the user know what is on the disk, copying from one disk to another and so on. As you might expect by now, there are lots of different operating systems available (each with its own advantages and disadvantages). The two most popular OSs are **CP/M** (Control Program for Micros) and **MS-DOS** (MicroSoft Disk Operating System).

Floppy disks provide a reasonably fast and efficient form of secondary storage and are cost-effective for business machines. For home computers, however, the usual form of program and data storage is on ordinary cassette tape using a standard cassette recorder. This method of storage is slow and unreliable, but is very cheap and is adequate for games and the like.

Another type of disk you'll see referred to is the **hard disk**. This is an extremely efficient method of storing large amounts of programs and data. Hard disk capacity generally starts at around **10 Mbytes** (10 million bytes) and rises to . . . well, you name it. Besides offering a much greater capacity than floppies, hard disks are more reliable and considerably faster. They are, however, much more expensive than floppy drives.

Since computers need some way of communicating with the outside world, we need input and output devices. **Input and output devices** include all manner of things from hard disk units to light-pens, but the minimum requirement for most applications is a typewriter-style **keyboard** for input and a tv-like **Visual Display Unit** for output. The Visual Display Unit is variously referred to as a **VDU, Cathode Ray Tube (CRT)** and **monitor**.

The various component parts of a computer system (processor, keyboard, VDU, disk drives, etc) may all be built in to a single unit or they may be separate, connected by cables.

Take this paragraph slowly and it makes sense! When a computer communicates with an outside device, be it a printer or another computer, it does so in one of two forms — **parallel** or **serial**. **Parallel input/output (I/O)** requires a number of parallel wires. Each wire carries one bit, so with 8 wires we can transmit/receive information one byte at a time (8 bits = one byte, remember). **Serial I/O**, in contrast, uses a single wire to transmit a series of bits one at a time with extra bits to mark the beginning and end of each byte.

To enable different devices to communicate with each other in this way, standards have been agreed for different **interfaces**. An interface is simply a piece of circuitry used to connect two or more devices. The most common standard serial interface is the **RS232** (or **V24**) while the **Centronics** standard is popular for parallel interfaces.

When two computers want to communicate with each other over a distance, there are again two ways of doing it. Both methods use the public phone network. The simplest and cheapest method is to use a device known as an **acoustic coupler**. This simply plugs into your computer, and has a receptacle into which you place your telephone handset. However an acoustic coupler is slow and not exceptionally reliable.

A more sophisticated (and correspondingly more expensive) method is to use a **modem**. Unlike an acoustic coupler, a modem is wired into the telephone system and you should get permission for this from British Telecom.

So, now you know!

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to 'TJ's Workshop', PCW, 62 Oxford Street, London W1A 2HG. Please keep your contributions as concise as possible. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for any damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

LYNX TIPS

Here are a few tips for Lynx users. The Lynx provides the EXT command in Basic but the Basic manual does not explain its use. EXT, in fact, allows you to pass parameters to a subroutine just as in MON command G XXXX ABCDEFGH will call XXXX and the DE register pair points to the first character after the hex address. But EXT does a call to &6224 which normally has a JP &3B32 instruction, ie, NOT YET IMPLEMENTED message. Therefore to use the EXT facility one must DPOKE &6225,X where X is the address of the machine code subroutine.

EXT can be used to access MON routines, from a Basic program, which do not have Basic equivalents, for example, save blocks of memory (MSAVE facility).

```
100 DPOKE &6225,&3EFC
110 EXT 6707 6808 0000
"DATA"
```

will call MON's D command and save memory between &6707 to &6808 which is the part of memory that contains the variables A-Z and a-z. Thus to get the saved variables use MLOAD "DATA". Arrays and strings are stored at the end of the Basic program and DPEEK(&61FC) gives the end of the Basic program and DPEEK(&621F) gives the end of arrays and strings.

Besides saving the values of the arrays and strings one must save the block of memory which holds their locations, &6810 to &694B, thus it is better to have a specially written program for that.

The addresses of other MON commands can be found with this program:-

```
100 FOR A=&3BCF TO
&3CO1 STEP 2
110 PRINT "MON
Command";CHR$(A/2-
&1DA6);" Routine Address
at";DPEEK(A)
120 IF INP(&0480)=&00F7
THEN GOTO 120
130 NEXT A
140 END
```

Holding the space bar down stops the program printing (Line 120).

Some routines should be run using the BASIC CALL MON routine. H is best with CALL &3C7E,A where A is the address of the hex dump. MON routine M should be called using CALL &3C70,A.

The gap between lines, useful during listing, can be varied by first POKE &628D,&C9 then DPOKE &628B,&C6. Since a call to &628B is made every time a new line is needed, at &628B we put an ADD A,N & RET instead of just a RET. Therefore a POKE &628C,10 will cause a whole line to be skipped. POKE &628C,0 is the normal spacing. To condense the line to give 30 lines per screen POKE &628C,&FE.

Sometimes one does not want the next line to be cleared everytime a carriage return is sent to the screen. This can be turned off by DPOKE &622F,&0217 and back on by DPOKE &622F,&3518.

Bonn Domnick D'Silva

BBC BASE ADDRESSES

A useful feature of the BBC machine is the facility to re-define the base address of the function keys using *FX225. Normally the function keys generate ASCII codes starting at 128 for f0, 129 for f1, etc, but *FX225 allows almost any range of ASCII codes to be generated — in the user defined range, for example.

Thus, if you want to generate user defined characters (accented letters, mathematical symbols, space invaders, etc) directly from the keyboard, simply redefine the base address of the function keys to coincide with the user defined character range 224 to 255 as desired.

In addition *FX226 redefines the base address for the 'shifted' function keys, so by redefining this, too, up to 20 user defined characters can be generated directly onto the screen from the keyboard.

For example, *FX225,230 sets the base address of the function keys to 230 and *FX226,240 sets the base address of the shifted function keys to 240. Thus, if function key 3 is pressed the character equivalent of ASCII code 233 will be displayed. If function key 3 is pressed in conjunction with the shift key, the character equivalent of ASCII code 243 will be displayed.

```
 10 MODE2
 20 REM set base addresses
 30 *FX225,230
 40 *FX226,240
 50 REM define characters
 60 VDU23,230,&3C,&20,&10,&08,&08,&10,&20,&3C
 70 VDU23,231,&3C,&24,&24,&24,&24,&24,&3C,0
 80 VDU23,232,&08,&14,&22,&41,&22,&14,&08,0
 90 VDU23,233,&32,&4C,0,&66,&76,&6E,&66,0
100 VDU23,240,255,165,255,165,255,165,255,165
110 VDU23,241,0,36,126,90,36,66,129,0
120 VDU23,242,36,102,255,231,255,189,153,165
130 VDU23,243,0,24,60,66,255,129,0,0
140 REM press function keys & display characters
150 CLS
160 COLOUR7
170 PRINT'"Press f-key: ";
180 A$=GET$
190 PRINT A$'
200 FOR X%=1 TO 15
210 COLOURX%
220 PRINT A$;
230 NEXT X%
240 PRINT
250 GOTO160
```

The program above is a simple illustration of how this could be used. The base address of the function keys is set to 230 and that for the shifted function keys to 240. User defined characters are defined for ASCII codes 230 to 233 (function keys f0 to f3) and 240 to 243 (shift-function keys f0 to f3). Pressing any other function key will produce random shapes as the character codes generated by these keys are left undefined. Press any of these function keys, with or without the shift key, when prompted to do so and see the user defined characters displayed.

Derek Hufton

ORIC TOP LINE PRINTING

ORIC 1 owners who wish to write games programs may find problems in displaying scores; especially if the game requires the screen to be scrolled. Here is a short subroutine which allows information to be put on the top line which is usually reserved for the computer's own messages. This line does not scroll with the rest of the screen and the information can be easily updated.

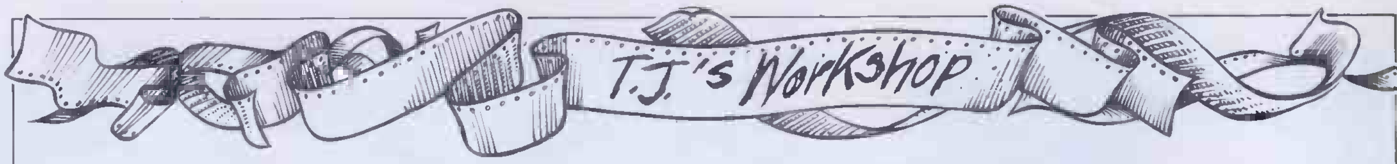
This routine will be helpful to 16k users if they subtract 8000 (hex) from all addresses used.

```
100 M$="INFO. TO GO ON
    TOP LINE"
110 FOR A=#BB83 to
    #BB83+36:POKE
    A,32:NEXT A
130 FOR A=1 TO LEN(M$):
    POKE#BB83+A,ASC
    (MID$(M$,A,1)):NEXT A
140 RETURN
```

Note — the text can be made flash by adding:

```
120 M$=CHR$()+M$
```

Colin Failes



ACORN ATOM LISTER

The program below is designed to list out programs on an Acorn Atom preceding each line with the address in hexadecimal of its first character. The program suppresses any control characters and converts CR to CR/LF.

It was designed so that parts of programs could be swapped around quickly. This can be done by copying the lines and changing the line numbers, but this is slow if large blocks need to be shifted. What is needed is to know the position in memory of the start of the various lines, and this program will provide that information. When the program Is run it requests a start address. This is the address of the start of the program and will usually be #2900. Then the program will dump the lines to the screen, preceding each one with its address and stripping off any line numbers, etc. Also, any program lines at the end of a program can be deleted by using the utility to find where the first line to be deleted is in memory (call this X) and then executing:

```
FOR I=X TO TOP STEP
4;!I=#ODFFODFF;NEXT
```

```
 5 INPUT "START
   ADDRESS"K
10 DO
15 PRINT &K," "
20 DO V=?K
25 IF V<32 AND V<>#D
   GOTO 40
30 IF V=#D PRINT':GOTO 45
35 PRINT $V
40 K=K+1
45 UNTIL V=#D
50 K=K+3
55 UNTIL K?-2=255
60 END
```

P Hulse

VIC ON ERROR GOTO

VIC Basic has been criticised for not having the advanced features, such as BBC Basic has. There is one feature, however, of BBC and Atari Basics that can be quite easily duplicated on a VIC without having to recourse to machine code.

This short subroutine reproduces the 'ON ERROR GOTO' command in quite a novel way.

```
100 A$ = "GOTO"+STR$
(EL)+CHR$(13)
110 L=LEN(A$):POKE 198,L
120 FOR A=1 TO L:POKE
630+A,ASC
(MID$(A$,A)):NEXT A
130 RETURN
```

The subroutine uses the fact that the VIC has a ten character keyboard buffer (locations 631-640) into which data can be typed while a program is running. If program execution is halted by an error, the contents of the buffer are then printed on the screen and executed. The subroutine simply POKEs data into the buffer for when an error is encountered.

To use the subroutine, use the following:-
EL=nn:GOSUB100
where nn is the number of the line to be jumped to when an error occurs.

E Butler

BBC TAPE/DISK TRANSFER

One of the well-known problems relating to the BBC disk system is that of converting cassette programs to disk form, when the length of the program is such that it cannot be fitted into the smaller amount of available RAM of the disk machine. The problem is by this time well-known, and methods of getting around it are also well-known. I have never seen any mention of the associated problem of coping with long Wordwise files, however. It is possible to dump a book chapter of almost 5000 words to tape, and many of my books exist in this form. When I (at last) was able to lay my hands on a BBC disk machine, I found that several chapters of a new book, which had been dumped to tape, could not be read in full.

Now the problem can't be dealt with so simply as that of a long program. The dodge of setting the start-of-available RAM address down by using PAGE=&0E00 is useless with Wordwise, because each time Wordwise is accessed, it sets PAGE at the address specified by the DFS. As it happens, I use the excellent PACE/AMCOM DFS in order to gain some memory, but even this was not sufficient.

The following method has proved to work reliably. It depends on switching to Basic, setting PAGE to the address that is used by the cassette system, and loading the Wordwise file into memory as if it were a machine-code program. This is then dumped back to another cassette in two halves — the first half, at any rate, cannot be dumped to disk without overwriting the file. The separated halves are then read by Wordwise in the normal way, and subsequently transferred to disk. In detail, the steps are:

1 Return to Basic. Type *Tape, and then PAGE =&0E00.
2 *LOAD "file" 0E00 — this loads a file called 'file' into memory starting at 0E00. Note the length of this file from the screen message at the end of loading.
3 Split the file by using, for example, *SAVE "file a"0E00 0301 and then *SAVE "file b"0300 71D0, with a fresh tape ready in the cassette machine. These are examples only — you will have to find how long the file is from the message at the *LOAD stage, and add this (hex) number to 0E00 to find the end of the file. The result of this step is to have two files on tape.
4 Type *W., select new text, then *TAPE.
5 Load in "file a", using Wordwise normally (option 2). Then use *DFS and *SYS1 (if you have the PACE/AMCOM DFS) or *DISC to revert to disk filing. Now use the Wordwise option 1 to save this file on disk.
6 Select *TAPE again, load in "file b", then select disk and save to disk as in step 5. The result of all this hard work will be the file on disk, split into two sections. Some day, at the other end of the 'tube', all this will not be necessary!

Incidentally, when I am using Wordwise, and fill the disk, the message I get is 'faulty drive', and the only way out is by using BREAK. Anyone else noticed this?

Ian Sinclair, Technical Author

SHARP ON ERROR NEW

The 'ON ERROR NEW' command has been simulated on the SHARP MZ-80A/K running under Basic SP-5025. When a program is run it should contain the following Basic command:

```
POKE 4975,0
```

(or if preferred it could be entered in direct mode).

Whenever there is a Syntax error, or memory error, etc (even when SHIFT & BREAK are pressed on the Sharp MZ-80A) the program is halted and a cold BOOT is initiated.

This is a powerful program-protection 'command' and if an MZ-80A is running under Basic SP5025, then once this command has been executed the program is almost un-BREAKable.

N Alan

ZX SPECTRUM BUG

The program below for the ZX Spectrum shows another of the now famous but interesting bugs by which the machine is troubled.

```
10 IF INKEY$<>"" THEN GO
   TO 10
20 IF INKEY$="" THEN GO
   TO 20
30 PRINT INKEY$:
40 GO TO 10
```

It is given in chapter 18 of the manual as a demonstration of the INKEY$ function. Run it, and then try pressing CAPS SHIFT-5 (cursor left) a few times and watch the interesting results. Some *very* strange things can happen to the listing especially if you try to alter or re-enter one of the affected lines. Is there any explanation of this?

Tim Hodges

PAUSE FOR BBC

This is a short routine which provides the BBC Micro with a very useful 'pause' key. It uses the BBC Micro's event handling system to report any key being pressed. If the key being pressed is the 'pause' key, the program waits until it is pressed a second time before continuing.

The idea of the pause function is, firstly, as a programming aid to stop a program while it is running and then continue even in the middle of loops or procedures. Secondly, it enables programs (such as games) to be stopped, in order to answer the telephone or make coffee.

Once assembled, the program occupies only 63 bytes and this can be reduced further if necessary. The first three lines of the program enable the user to select the key to be used (I have found that TAB is the most useful) and also the memory location into which the routine will be assembled. S% is the start address, key% is the ASCII code for the key and negkey% is the negative code for the key used with INKEY (*User Guide* p275) expressed as the last byte of a hex number, for example,
TAB:- PRINT~-97AND&FF

When run the program assembles the coding and then calls S% which enables the event handling system. S% must be called after every break and so it is useful to define key 10 for this purpose. Once assembled the Basic program is no longer required and can be overwritten.

The safest place for the routine is between &DC0 and &DFE. This leaves the early part of Page &D free for other user routines. To use the routine with other prgrams it is best to assemble it before loading the new program. For use with Acornsoft's Snapper, Meteors, Monsters and Defender (not Planetoid), &DC0 is a free area of memory for the routine. The unassembled version can easily be appended on to the title program.

```
10 S%=&DC0
20 key%=9
30 negkey%=&9F
40 FOR X=0 TO 2 STEP 2
50 P%=S%
60 [OPT X
70 LDA#(S% AND &FF)+18 /STORE START ADDRESS
80 STA &220
90 LDA#(S% AND &FF00)/256
100 STA &221
110 LDA#14 /ENABLE KEYBOARD EVENT
120 LDX#2
130 JSR &FFF4
140 RTS
150 CPY #key% /TEST FOR 'PAUSE' KEY
160 BEQ pause
170 RTS
180 .pause
190 PHP /SAVE REGISTERS
200 PHA
210 TXA
220 PHA
230 TYA
240 PHA
250 LDA#7 /BEEP
260 JSR &FFEE
270 LDX#0 /DELAY
280 .L2
290 LDY#0
300 .L1
310 DEY
320 BNE L1
330 DEX
340 BNE L2
350 .repeat /WAIT FOR 'PAUSE' KEY
360 LDY#&FF
370 LDX#negkey%
380 LDA#&81
390 JSR &FFF4
400 TYA
410 BEQ repeat
420 PLA /RESTORE REGISTERS
430 TAY
440 PLA
450 TAX
460 PLA
470 PLP
480 RTS
490 ]
500 NEXT X
510 CALL S%
520 *KEY10"CALL S%:M
```

Andrew J Macdonald

ORIC 1 VERTICAL SCROLLING

If the vertical cursors are pressed continuously on the Oric, it can be seen that when the cursor reaches the top left corner or bottom left corner, the screen scrolls down or up respectively.

This can be accessed from a program with the following commands:

Scroll up: enter either PRINT or PRINT CHRS(10) at the appropriate position in the program: for example,

```
10 CLS
20 PLOT 10,26,"SCROLL UP"
30 PRINT CHRS(10)
40 GOTO 30
```

(Note: line 30 can be substituted with PRINT)

Scroll down: enter PRINT CHRS(11)CHRS(11) — for example,

```
10 CLS
20 PLOT 10,0,"SCROLL DOWN"
30 PRINT CHRS(11)CHRS(11)
40 GOTO 30
```

HS Lim

SPECTRUM RANDOMIZE

Here is an interesting bug which I'm sure wil be useful to all Spectrum owners. Just type in RANDOMIZE USR x (where x is in the range 1270→127a). The effect is quite stunning and can be stopped by pressing the space bar. As far as I know it can be used in programs with no effect on the running at all.

J Paveley

TRS-80 COMPUTED RESTORE

I have written a Basic subroutine to "RESTORE" to a specified line number. To use it, set X to the line number to which you wish to RESTORE, and call the routine with GOSUB 35000.

If you use a non-existent line number, the routine will give the message "NO SUCH LINE."

```
35000 X1=INT(X/256):
      X2=X-X1
      *256:PR=17129
35010 LN=PEEK(PR+2)
      +256*PEEK(PR+3):
      IF LN>X THEN PRINT
      "NO SUCH LINE.":
      RETURN
35020 IF LN<X THEN
      PR=PEEK(PR+1)*
      256+PEEK
      (PR):GOTO 35010
35030 PR = PR - 1:POKE
      16640, INT(PR/256):
      POKE 16639,
      PR-256*PEEK
      (16640)
35040 RETURN
```

I hope this will be useful to TRS-80/Video Genie Users translating from machines with the RESTORE X facility.

Darrel Francis

BBC TAB

When the Tab key (or CTRL-I) is pressed on the BBC Micro, the computer moves the cursor but does not insert anything into the keyboard buffer. The following program, which uses the event handling routines of O.S. 1.0. and upwards, changes this to operate in a similar way to a Tab key on a typewriter.

After every depression of the Tab key the cursor will be moved to the next tab position. At the same time the correct number of spaces is entered into the keyboard buffer. Tab positions occur every eight columns.

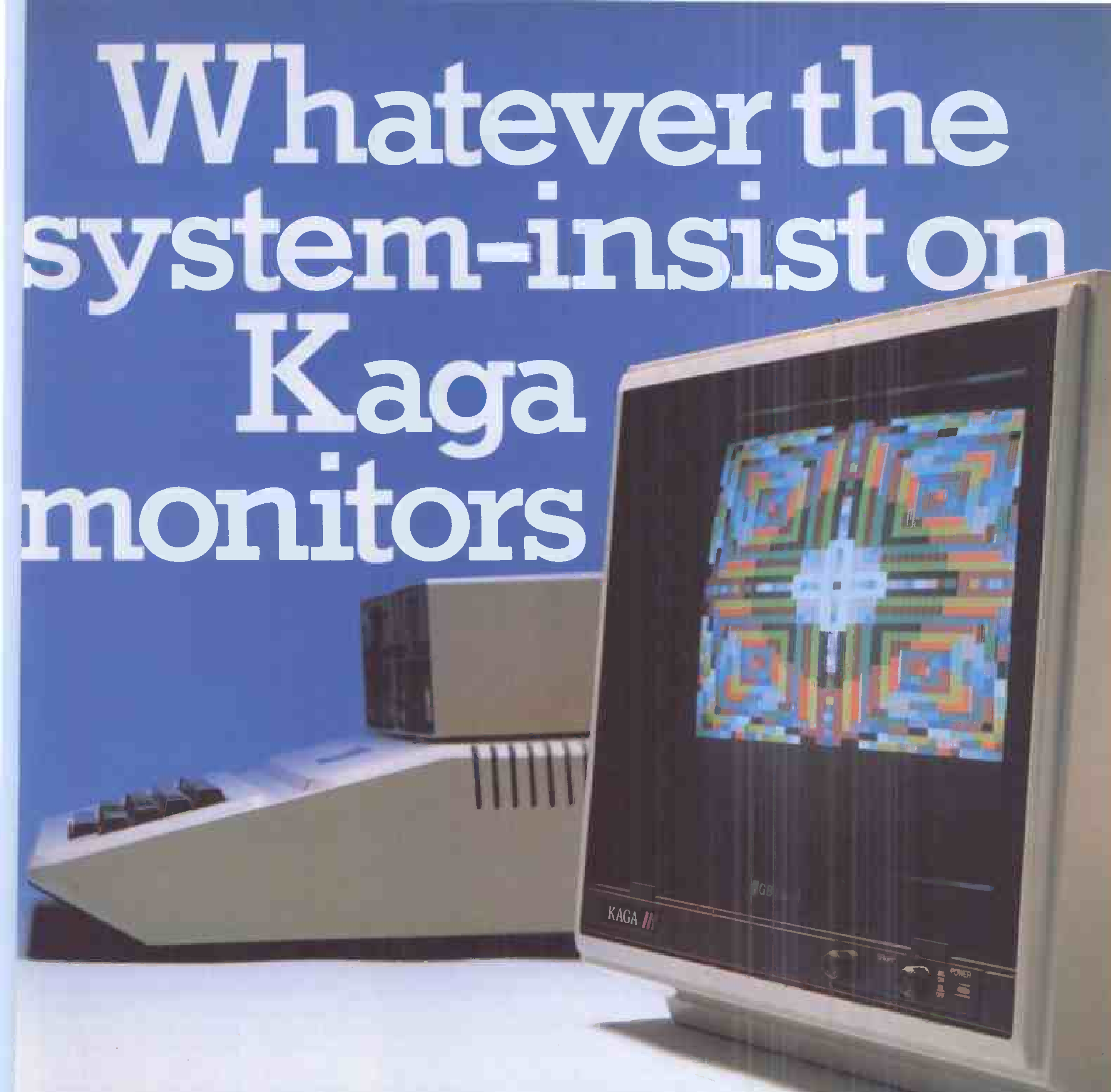
The program uses the event handler to set up an event when any key is pressed. If this is not the Tab key the routine exits, otherwise the current position of the cursor is found via the OSBYTE call 134. The next Tab position is then calculated and the difference between the two is the number of spaces that need to be inserted into the keyboard buffer. After these have been printed, a backspace character (CTRL-H) is output to offset the forward-cursor which is still printed by the Tab key.

The last part of the program, in Basic, appends the initialisation routine to whatever the BREAK key contains. To enter the token for CALL (see lines 830-840) enter mode 7 and print CHR$(& D6). Then use the 'COPY' key to transfer this to the program line. This version of 'CALL' uses only 1 byte compared to the 3 required for the shorthand Basic form 'CA.'.

```
LIST
   10 REM
   20 REM
   30 REM
   40 REM       A program to allow the "Tab" key on the BBC to act
   50 REM       in a similar way to that of a typewriter/word-processor
   60 REM
   70 REM       Written by:  Jim Aitken
   80 REM                    2nd August 1983 for BBC BASIC (O.S  1.2)
   90 REM
  100 MC=&A00
  110 OSBYTE=&FFF4
  120 FOR I=0 TO 3 STEP 3
  130 P%=MC
  140 [
  150 OPT I
  160 .Count     NOP              \Store # of chars to next TAB
  170 .Tab       PHP              \Save Processor status
  180            CPY #9           \If not "TAB" key
  190            BNE Rts          \Then forget it
  200            PHA              \Otherwise carry on
  210            TXA
  220            PHA              \Save registers
  230            TYA
  240            PHA
  250            LDA #134         \Get horizontal position of cursor
  260            JSR OSBYTE       \(Stored in X)
  270            STX Count        \Save for later
  280            TXA
  290            LSR A            \Find new "TAB" position
  300            LSR A            \New=((Old DIV 8)+1)*8
  310            LSR A            \First divide by 8
  320            CLC
  330            ADC #1
  340            ASL A
  350            ASL A            \Then multiply by 8
  360            ASL A
  370            SEC
  380            SBC Count        \Find number of spaces required
  390            STA Count
  400            LDA #138         \Insert characters into keyboard buffer
  410            LDX #0
  420 .Intobuf   LDY #32          \ASCII for space
  430            JSR OSBYTE
  440            DEC Count        \Finished?
  450            BNE Intobuf      \No.  Do again
  460            LDY #8           \Print CTRL-H (Backspace) to nullify
  470            JSR OSBYTE       \Effect of CTRL-I (Tab)
  480            PLA              \Restore registers
  490            TAY
  500            PLA
  510            TAX
  520            PLA
  530 .Rts       PLP
  540            RTS
  550 .Init      LDA #(Tab MOD 256)
  560            STA &220          \Change event handler to vector to
  570            LDA #(Tab DIV 256)
  580            STA &221         \this routine
  590            LDA #14          \Set up keyboard event
  600            LDX #2           \Via osbyte
  610            LDY #0
  620            JSR OSBYTE
  630            RTS
  640 ]
  650 NEXT
  660 REM Now ADD the initialisation routine to the definition
  670 REM for KEY 10 (Break).
  680 REM Adapted from a routine by J. Ruston
  690 REM
  700 DIM Key10buf 40
  710 Key10$=STRING$(30," ")
  720 Key10$=""
  730 Start=?&B0A
  740 End=256
  750 FOR Key=0 TO 15
  760 IF Key?&B00>Start AND Key?&B00<=End THEN End=Key?&B00
  770 NEXT
  780 IF End=256 THEN 840
  790 FOR Pnt=Start TO End-1
  800 Char=Pnt?&B01
  810 IF Char>31 THEN Key10$=Key10$+CHR$(Char) ELSE Key10$=Key10$+CHR$(124)+CHR$
(Char+64)
  820 NEXT
  830 REM"V=Token for "CALL"
  840 $Key10buf="*K.10"+Key10$+"V&"+STR$~(Init)+"|M"
  850 X%=Key10buf MOD 256
  860 Y%=Key10buf DIV 256
  870 CALL &FFF7
  880 END
>
```

Jim Aitken

Whatever the system-insist on Kaga monitors



<u>First choice for quality</u>: Kaga Monitors enjoy a world-wide reputation for superb definition and clarity of image whether in Green, Amber, or full RGB colour.

<u>First choice for value:</u> Kaga quality at Kaga prices makes Kaga unbeatable.

<u>First choice for reliability</u>: Kaga Monitors are specifically designed for use with computers, custom-built for the functions they perform, with solid state circuitry to ensure utmost reliability.

<u>First choice for compatibility</u>: Kaga Monitors are compatible with all popular micro computers. Apple™, Acorn/BBC™, Commodore Pet™, IBM™, Osborne™, Tandy™, you name it, Kaga's made for it. Kaga RGB Monitors have built-in switchable interface allowing simple plug-in compatibility for most micros with RGB output. And the wide range of Kaga models means there's a Kaga ideally suited to your individual needs, whatever your computer.

<u>First choice for availability</u>: Wherever you are, there's a Data Efficiency Kaga dealer close at hand to advise and help you <u>before</u> and <u>after</u> you choose your Kaga Monitor. Ring 0442 60155 for details of your nearest stockist.

<u>Kaga Models and Prices:</u>
RGB Monitors from around £235 (retail)
Monochrome Monitors from around £100(retail)
Apple II RGB Adaptor and RGB Cables for most popular micros are available.

Prices ex-VAT and correct at time of going to press

Trade and OEM enquiries welcome

DON'T SETTLE FOR SECOND BEST - INSIST ON KAGA TO COMPLETE YOUR SYSTEM

DE Data Efficiency Ltd

For all your Micro needs...and more. (0442) 60155

Sole UK Distributors, **DATA EFFICIENCY LIMITED**, Computer Peripherals Division, Finway Road, **HEMEL HEMPSTEAD**, Herts. **HP2 7PS Tel: (0442) 60155 (14 lines) Telex: 825554 DATEFF G**

MATHS AT A PASS

TAKE YOUR PARTNERS FOR THE REVERSE POLISH

Is it a dance? Is it a leg lock? No, it's a notation. Tony Armitstead's layman's guide includes a Basic listing which will soon have you fluent in the techniques used by the Forth language for evaluating expressions.

Reverse Polish Logic and Reverse Polish Notation are expressions that are frequently heard in the microcomputer context. However, the actual use of the latter is rarely explained in any depth.

The main computing problem to which Reverse Polish Notation/Logic (RPN/L) is applied is in the evaluation of arithmetic expressions. Consider, for examples, calculating the value of 6*(7+2/(4^3)). Any person with a small knowledge of algebra knows that the solution is arrived at by 'doing the most nested calculation first' and obeying a set of operator precedence laws. The above example is done in the order: 4^3 first, then divide 2 by 4^3, then add this to 7 and multiply the answer by 6. Note that we divide 2 by 4^3 and do not divide 7+2 (=9) by 4^3. This is because '/' has a higher precedence than '+'.

For those who do not understand the term 'precedence', each pair of operators has a relative precedence. In any situation where it is unclear which operator to apply first, the one with the higher precedence is applied first.

Consider, for example, 2+3*4. Here it is unclear whether we mean (2+3)*4 or 2+(3*4), and it matters since the first evaluates to 20 and the second to 14°. The matter is resolved by comparing the precedence relation between '+' and '*'. '*' has a higher precedence than '+' (see below), and so we do the '*' first. Thus we come to the conclusion that 2+3*4=2+(3*4).

The precedence relations between the standard five operators [+,−,/,*,^] are:
prec(^)>prec(*)=prec(/)>prec(+)=prec(−)
where prec() indicates the precedence of the operator.

Using these relations we can actually remove a set of brackets from the first example, so that
6*(7+2/(4^3))=6*(7+2/4^3) because '^' has a higher precedence than '/', so that in the sub-calculation 2/4^3, we do 4^3 first, as was requested by the original bracketing. Note that in an example such as 6*7/8 the two operators have the same precedence. This tells us that it does not matter in which order the operators are applied. In such a situation it is usual to apply the operators from left to right, that is, we do (6*7)/8.

Now we know that we can evaluate such expressions, but what about the computer? The main problem is to make sure it does calculations in the correct order. You should try getting someone else to give you a calculation and then evaluate it by looking at only one character at a time. This is made difficult because of brackets and operator precedence.

A solution to this is to convert the expression to RPN, and then evaluate this using RPL. A great advantage with this solution is that it only takes one pass (ie, a scan from left to right) to form completely the RPN for any arbitrary expression.

In computing there are many ways of dealing with 'correct situations', but in pratice it is often the incorrect situation that is presented to the computer. This means that any method for dealing with expressions must also be good at detecting errors. Forming the RPN will usually detect any syntax errors, and if they are not found at this stage, then they are when the RPN is evaluated.

For those who have not met RPN before, I will give a few examples of its use and explain its principle.

In a normal expression, for example, 3+4, when we meet the operator and we do not have the two numbers we wish to add. RPN does not have this problem because we give the numbers *before* the operator. In RPN, 3+4 is written as 3 4 +, and when we meet the + we have both numbers to add. To evaluate the RPN we apply RPL to it, and for our purposes this can be summarised as follows: as the RPN is scanned from left to right, if you meet a number you store it and if you meet an operator then you apply this to the last number(s) stored. It is usual to store the numbers on a Last In First Out stack (LIFO stack), which is a 'tube' of numbers out of which you can pull only the last number pushed in. A more complicated example such as 6*(7+2/(4^3)) when converted to RPN becomes 6 7 2 4 3 ^ / + *. This is then evaluated by scanning from left to right and, upon reading a number, placing this on the stack and, upon reading an operator, pulling the top two numbers off the stack, applying the operator to them and putting the result back on top of the stack.

Notice that the RPN does not have any brackets, and can be evaluated by one scan. The actual evaluation of the RPN is very easy and so the problem of evaluating an arbitrary expression comes down to converting it to RPN. Before I show how this is done, I must point out that not all operators operate on two operands (numbers), and we have to distinguish between such operators. If an operator needs two operands it is called a 'Binary Operator' and if it needs one operand it is called a 'Unary Operator'. An example of a binary operator is '*' since it needs two operands to multiply together. An example of a unary operator is '—' in the sense that −5 means minus 5 (or negate 5) and only needs one operand. Care must be taken here to distinguish this operator from '−' in the sense of 5-2 which is a binary operator. It is unfortunate that both operators have the same symbol°. To distinguish between the two in RPN I will call the unary minus 'n' for negate. This means that the expression −5 translates to 5 n in RPN and the 'n' operates on the top number on the stack.

The precedence of the unary minus can be taken as the same as the binary minus or can have the highest precedence of all, depending on whether you want expressions such as −6^7 to mean −(6^7) or (−6)^7 respectively. I take the former precedence.

In order for the conversion to be able to cope with brackets we take '(' to be an operator and give it the lowest operator precedence. The reason for this will be seen later.

The algorithm (ie, method) given will accept as input an arithmetic expression and output the Reverse Polish equivalent. In doing this it uses a stack to store operators and so assumes that operators can be stored on such a stack.

Algorithm:
Any reference to a stack means the operator stack.

We first place a dummy operator on the stack, and give this operator the lowest precedence of all.

Label 1. Read in item and check for a valid operator or a unary minus or an open bracket. If we have a unary minus or an open bracket then we stack the item and goto 1. Otherwise we output the item.

Label 2. Read in item and check for valid operator or a close bracket. If we have a close bracket then we unstack operators and output then until we reach an open bracket (which we do not output) and goto 2. If the stack becomes empty before an '(' is met then there must be a missing '(' and we give an error message.

If the item was an operator then we compare its precedence with the one on top of the stack. If the stacked operator has a >= precedence then we unstack and output it and stack the item, otherwise we just stack the item. A special case arises if the unstacked operator was a unary minus. If so, we clear the stack until we meet an operator with *lower* precedence than the item, then we stack the item. We then goto 1.

If in reading an item, we find the input to be the end of the expression then we clear the stack of operators (outputing them of course). If in doing this we find a '(' on the stack, then there must be a missing ')' and so we give an error message.

The algorithm will have output the RPN for the given expression. To see the algorithm working, see Fig 1.

The purpose of the initial dummy operator on the stack was to force the first encountered operator to be placed on the stack. The reason whey an '(' is treated as an operator with low precedence is to place a marker on the stack that cannot be removed by any other operator. The market is then used when an appropriate ')' is encountered.

Well, so much for the theory, now for the practice. I have coded the algorithm in NewBrain Basic and this is given in Listing 1. The program will accept as input any calculation consisting of:

a) single digit operands,
b) any operator in [+,−,/,*,^],
c) any bracketing
d) any spacing

If there is an error in the input then this is pointed out, as is unmatched bracketing. The program closely follows the algorithm except that 'double negatives' are removed, that is, —5 is converted to just 5 instead of 5 n n.

rp	stack	calc
empty	:	(6*−5+2*(5+4))
empty	:(	6*−5+2*(5+4))
6	:(	*−5+2*(5+4))
6	:(*	−5+2*(5+4))
6	:(*n	5+2*(5+4))
6 5	:(*n	+2*(5+4))
6 5 n *	:(+	2*(5+4))
6 5 n * 2	:(+	*(5+4))
6 5 n * 2	:(+*	(5+4))
6 5 n * 2	:(+*(	5+4))
6 5 n * 2 5	:(+*(	+4))
6 5 n * 2 5	:(+*(+	4))
6 5 n * 2 5 4	:(+*(+	))
6 5 n * 2 5 4 +	:(+*	)
6 5 n * 2 5 4 + * +	:	empty

so the reverse polish is:
6 5 n * 2 5 4 + * + = −12

Fig 1 Reverse Polish

The program can be converted to other Basic dialects upon noting that put 31,22,x,y,'^' clears the screen, places the cursor at (x,y) and prints a ^ character.

The function INSTR(,) takes two string arguments and will return 0 if the second string does not occur in the first or gives the offset from the start of the first string where the second string is found, For example, INSTR('12345','3')=3,
INSTR('12345','8')=0
The INSTR function is used to test for valid operators and operands. If your micro does not have INSTR then you will need to replace this with a series of tests.

To define the precedence of the operators I have used the function FNpr( ) which takes a string argument and returns an integer in the range [0,4]; the larger the integer the greater the precedence of the operator.

For example, FNpr('+')=2 and FNpr('*')=3.

(Note that in NewBrain Basic TRUE=−1 and hence the − signs in the function.)

Some micros, such as the Dragon 32, will not allow string arguments to its functions so you will have to assign X$ before calling the function.

For example, X$=te$:pr=FNpr(X), with the daft dummy argument X⁰.

The variables in the program are:

ca$ — the expression
po — pointer into expression
st$,sp — the stack and stack pointer
nu$,op$— valid operands and operators
rp$ — reverse polish string
te$ — work string
x — parameter to decide where to jump back to (see line 280)
ng — flag used when top item on stack is 'n'

A brief description of the program is:

100 input expression
110–120 set up stack, etc.
130–140 input item (step over spaces)
150 check valid item using nu$
160–190 deal with – and (
200 output to rp$
210 input item
230 check valid using op$
240 deal with)
245 check top of stack for n
250 compare precedences and output to rp$ if necessary
260 add to stack

Illustration by Su Huntley & Donna Muir

MATHS AT A PASS

280 jump to correct place using x
290–330 clear stack of operators
340 print rp$
380 definition of FNpr()
400–440 clear stack to first(

In practice,one does not need to produce the whole reverse polish string and evaluate it; the evaluation can take place as the operators are output to reverse polish. Listing 2 does precisely this. The main differences from Listing 1 are the addition of a routine actually to do some calculation and the non-existence of rp$ since the numbers are put straight onto a calculation stack (the array st()).

The first program could be changed to accept an identifier as a variable name and thus convert arbitrary expressions to RPN. It could also be of use to someone learning to program in Forth. Since Forth works in RPN straightaway this shows one reason for its quicker execution — since it does not need to convert to RPN.

There are other ways of converting to RPN; for example, we could use a method called recursive-descent or use a tree structure and a bit of tree walking, but these are usually more applicable to compilers where the whole expression needs to be converted to machine instructions. The algorithm given is a direct approach that is perhaps more understandable than most and gives some insight into the uses of RPN. END

```
100 PUT 31,22,10,5 :INPUT ca$:
    IF LEN(ca$)=0 THEN 100
110 st$=" " :sp=1:nu$="0123456789-("
120 po=1:op$="+^-/*)" :rp$="":PRINT
130 IF MID$(ca$,po,1)=" " THEN po=po+1:
    GOTO 130
140 te$=MID$(ca$,po,1)
150 IF INSTR(nu$,te$)=0 THEN PRINT:
    PRINT nu$;" expected":
    PUT 22,11+po,6,"^",22,1,20:END
160 IF te$<>"-" THEN GOTO 190
170 IF RIGHT$(st$,1)<>"n" THEN
    st$=st$+"n":sp=sp+1:x=1:GOTO 280
180 st$=LEFT$(st$,sp-1):sp=sp-1:x=1:
    GOTO 280
190 IF te$="("THEN st$=st$+"(":sp=sp+1:
    x=1:GOTO 280
200 rp$=rp$+te$:x=2:GOTO280
210 IF MID$(ca$,po,1)=" " THEN po=po+1:
    GOTO 210
220 te$=MID$(ca$,po,1)
230 IF INSTR(op$,te$)=0 THEN PRINT:
    PRINT op$;" expected":
    PUT 22,11+po,6 ,"^",22,1,20:END
240 IF te$=")" THEN GOSUB390:x=2:
    GOTO280
245 ng=FALSE:IF RIGHT$(st$,1)="n"
    THEN ng=TRUE
250 IF FNpr(RIGHT$(st$,1))>=FNpr(te$)
    THEN rp$=rp$+RIGHT$(st$,1):
    st$=LEFT$(st$,sp-1):sp=sp-1:
    IF ng THEN250
260 st$=st$+te$:sp=sp+1
270 x=1
280 po=po+1:IF po<=LEN(ca$) THEN
    ON x GOTO 130,210
290 IF sp=1 THEN GOTO340
300 IF RIGHT$(st$,1)="(" THEN
    PRINT"missing )":END
310 rp$=rp$+RIGHT$(st$,1)
320 st$=LEFT$(st$,sp-1):sp=sp-1
330 GOTO 290
340 FOR i=1 TO LEN(rp$):
     PRINT MID$(rp$,i,1);" ";:
    NEXT i
350 END
380 DEF FNpr(x$)=-1*(x$="(")
    -2*(x$="+" OR x$="-" OR x$="n")
    -3*(x$="*" OR x$="/")-4*(x$="^")
390 REM
400 IF RIGHT$(st$,1)="(" THEN
    st$=LEFT$(st$,sp-1):sp=sp-1:RETURN
410 rp$=rp$+RIGHT$(st$,1)
420 st$=LEFT$(st$,sp-1)
430 sp=sp-1:IF sp<=1 THEN
    PRINT"missing (":END
440 GOTO 400
```

Listing 1. Program 'REV-POL'

```
100 DIM st(20)
110 PUT 31,22,10,5:
    INPUT("Enter calculation: ") ca$:
    IF LEN(ca$)=0 THEN 110
120 st$=" ":po=1:sp=1:cs=0
130 nu$="0123456789-("
140 op$="+-*/^)":so$="+-*/^n"
150 GOSUB 650
160 IF INSTR(nu$,te$)=0 THEN PRINT:
    PRINT nu$;" expected":
    PUT 22,28+po,6,"^",22,1,20:END
170 IF te$<>"-" THEN GOTO 200
180 IF RIGHT$(st$,1)<>"n" THEN
    st$=st$+"n":sp=sp+1:x=1:GOTO 290
190 sp=sp-1:st$=LEFT$(st$,sp):x=1:
    GOTO 290
200 IF te$="("THEN st$=st$+te$:sp=sp+1:
    x=1:GOTO 290
210 st(cs)=VAL(te$):cs=cs+1:x=2:GOTO290
220 GOSUB 650
230 IF INSTR(op$,te$)=0 THEN PRINT:
    PRINT op$;" expected":
    PUT 22,28+po,6 ,"^",22,1,20:END
240 IF te$=")" THEN GOSUB360:x=2:GOTO290
250 ng=FALSE:IF RIGHT$(st$,1)="n" THEN
    ng=TRUE
260 IF FNpr(RIGHT$(st$,1))>=FNpr(te$)
    THEN GOSUB 400:IF ng THEN 260
270 st$=st$+te$:sp=sp+1
280 x=1
290 po=po+1:IF po<=LEN(ca$) THEN
    ON x GOTO 150,220
300 IF sp=1 THEN ?st(0):END
310 IF RIGHT$(st$,1)="(" THEN
    PRINT"missing )":END
320 GOSUB 400
330 GOTO 300
340 DEF FNpr(x$)=-1*(x$="(")
    -2*(x$="+" OR x$="-" OR x$="n")
    -3*(x$="*" OR x$="/")-4*(x$="^")
360 IF RIGHT$(st$,1)="(" THEN
    st$=LEFT$(st$,sp-1):sp=sp-1:RETURN
370 GOSUB 400
380 IF sp<=1 THEN PRINT"missing (":END
390 GOTO 360
400 REM Operate with right$(st$,1) on
    stack
410 ON INSTR(so$,RIGHT$(st$,1))
    GOSUB 440,470,500,530,570,600
420 sp=sp-1:st$=LEFT$(st$,sp)
430 RETURN
440 GOSUB 630
450 st(cs-2)=st(cs-2)+st(cs-1):cs=cs-1
460 RETURN
470 GOSUB 630
480 st(cs-2)=st(cs-2)-st(cs-1):cs=cs-1
490 RETURN
500 GOSUB 630
510 st(cs-2)=st(cs-2)*st(cs-1):cs=cs-1
520 RETURN
530 GOSUB 630
540 IF st(cs-1)=0 THEN
    PRINT"division by zero":END
550 st(cs-2)=st(cs-2)/st(cs-1):cs=cs-1
560 RETURN
570 GOSUB 630
580 st(cs-2)=st(cs-2)^st(cs-1):cs=cs-1
590 RETURN
600 IF cs<1 THEN
    PRINT "stack under flow":END
610 st(cs-1)=-st(cs-1)
620 RETURN
630 IF cs<2 THEN
    PRINT "stack under flow":END
640 RETURN
650 IF MID$(ca$,po,1)=" " THEN po=po+1:
    GOTO 650
660 te$=MID$(ca$,po,1)
670 RETURN
```

Listing 2. Program 'EVAL'

LEISURE LINES

by J J Clessa

Quickie

The total number of heads and arms, of horses and riders, in a stable is equal to the number of legs. What is the least number of horses and riders that there could be?

Prize Puzzle

Using each of the digits 0 through 9 once only, form the smallest 10-digit number that is exactly divisible by every integer from 1 to 12 inclusive.

Answers please — postcards or backs of envelopes only — to reach *PCW* by 30 November, 1983. Send your entries to *PCW* Leisure Lines, Prize Puzzle November, 62 Oxford St, London, W1.

Prize Puzzle August

The August puzzle didn't present too many problems — as it happens there were quite a variety of solutions permissible. A lot of readers, however, seemed to miss the fact that within each family, the names had to be in alphabetical order during the count-off.

Only about 150 readers sent in entries, not all of them correct. I had great fun checking several of them on a Sirius until I found a winning entry from Richard Tang of Rochdale. Congrats, your prize will be arriving shortly.

Richard's solution, one of many, was:

Adams	B	F	J
Baker	A	C	M
Chambers	B	L	T
Dawson	G	M	S
Eastwood	P	R	T
Finch	M	S	Y

Note: Don't forget to watch out for *Micropuzzles* — it contains many previous 'Leisure Lines' puzzles plus many new ones. There's also Quickies — with answers — and a chance to enter the Puzzle Trilogy and win a brand new Apricot micro. So don't miss it.

COMPUTERISING YOUR BUSINESS
PART 2 ~SETTING UP

Jon Vogler tells a cautionary tale with lots of advice on using a micro to run your business. Applications include wordprocessing, accounting and spreadsheet.

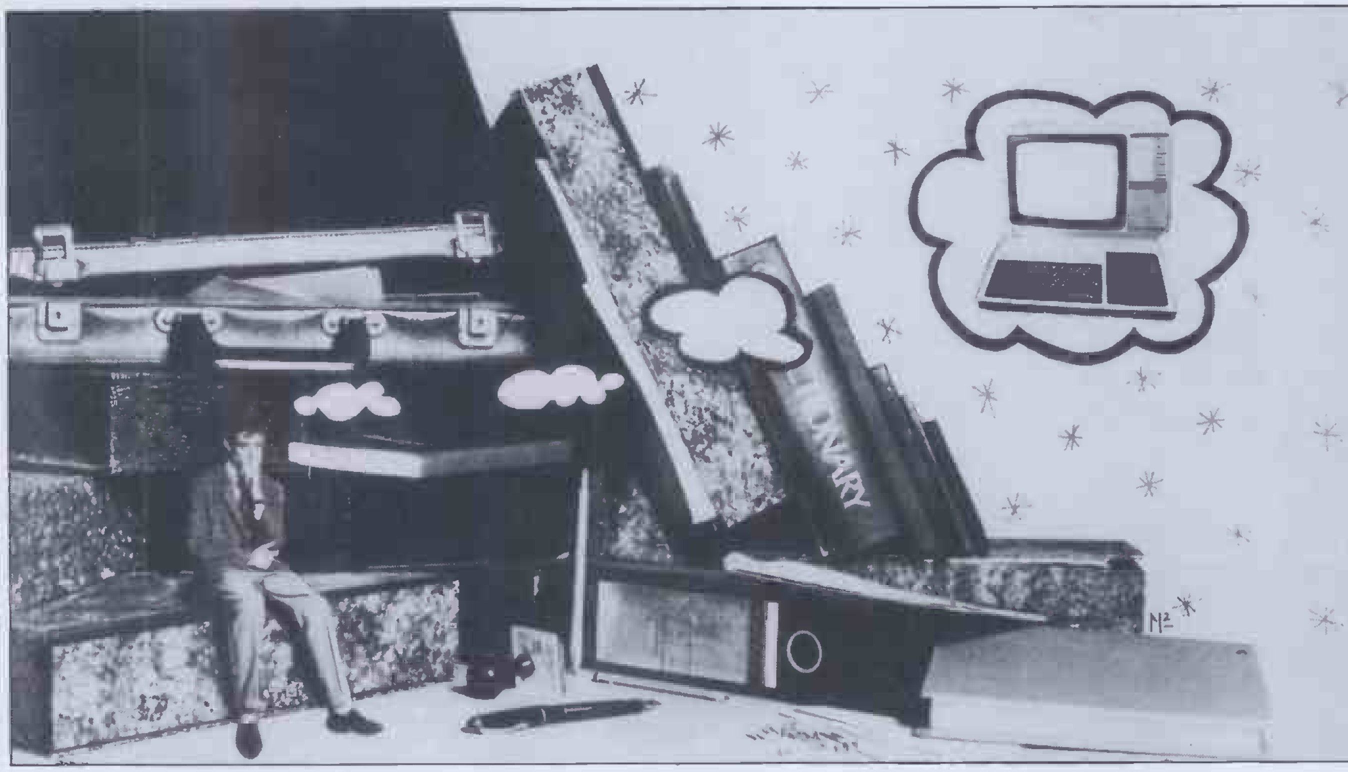
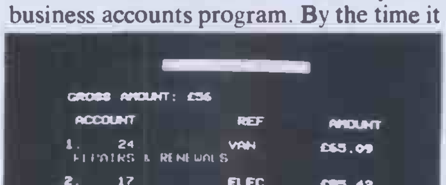


Illustration by Carol Moss

Every year, about this time, I dump two hefty box files of incoherent records of my one man business on my tax accountant's desk. He turns white, protests that I need an archaeologist, not an accountant, but returns them a month later with a neat set of accounts on three sides of A4, together with an alarming bill. This time, seeing that I was claiming capital allowances for a microcomputer, he asked, with a wistful look in his eye, 'Could you use it to keep your books?'

So I invited him home to see my new business accounts program. By the time it reached the point where the year-end balance sheet came spewing out of the printer, crisp, flawless and breathtakingly fast, he was caught. 'If some of my other clients could use that . . .' he said, and I saw in his eyeballs a vision of May and June spent on the Costa del Sol instead of behind an adding machine in his dusty office. Then he added ruefully '. . . but our small business clients can't afford such a thing.'



Financial summaries

I explained that it was not cost that would be the problem: my own installation (described in last May's issue of *PCW*) cost under £2000 and was larger than most small enterprises would need. The real difficulties were . . . but perhaps I had better tell you them in detail.

Life and times

It is not coincidence that the use of computers in business started with the *big* companies: the ones with hundreds of customers, thousands of employees, tens of thousands of items in stock. Only they could benefit from the computer's ability to repeat operations quickly and economically. The small businessman or woman, (who from now on I'm going to refer to as 'he', but only for convenience), needs none of these economies of scale. He just wants help with the arithmetic of a small set of books and orderly systems in an office which is often only the kitchen table after supper or a corner of a leaky, noisy manufacturing shed.

Does the micro offer these? Can it wave a magic wand and free him from those tedious hours of bookkeeping after the weary working day has ended; the one part of the job for which he was never trained? Can it inject system and method so that debtors are called before they slyly go bankrupt and goods paid for that have actually been delivered? Above all, can it help him control his business: take action to prevent, not as a result of, things going wrong; know month by month what lines are profitable or whether his liquidity can stand that special piece of equipment that will cut hours off a job but costs more than he expected?

What the micro can do

The answer is a mixed one. The operations that he can realistically expect are as follows:

First, bookkeeping. The micro need not produce a professional set of accounts because the businessman cannot afford to sack his accountant, on whom he depends for tax advice. Instead an accurate, analysed summary, monthly as well as at the end of the year, will give valuable management information, reduce the number of hours the accountant spends crunching figures and sorting out confusion, and consequently reduce the latter's fee.

Second, economies on correspondence. Most business letters fall into a limited range of standard formats; all that varies is the customer and the details of the order. Word processing offers great advantages in this field.

Finally, all businesses, large or small, need good managerial control, based on a combination of realistic forward budgeting, coupled with up-to-date, factual information about progress against the budget.

There are other matters, particularly stock control and the production of invoices and statements, that will also be of value but the three listed above are of

Menu selection

overriding importance and will be considered in this article.

What hardware?

What basic equipment will be required? The central processor does not need large amounts of memory but word processing gets simpler the more that is available and spreadsheet programs are very memory-greedy. 32k is sufficient but 64k gives an extra margin. The keyboard must be of typewriter quality and a separate numerical keypad is an advantage.

Cash flow

Most data will be held on disk. Tape is too slow for the businessman and he is not short of the necessary (tax-deductible) cash to buy a single disk drive. Indeed, he may prefer a double one, so that he can keep standard software utilities and various workhorse programs in one and' the data files in the second, without constantly switching.

A colour monitor is a disadvantage because, wherever the machine is located, children or employees are liable to play Space Invaders. Even in restful green, recommended to ease the operator's eyes over a full working day, there is a danger of meddlers wiping the whole year's books off a disk. Of course, this risk can be offset by triplicating all disk files and this is another reason for having a dual disk drive, which makes disk copying fast and effortless.

The most difficult choice will be the printer. If letters to potential customers are part of the selling process, as for a freelance writer, an architect or an interior designer, then a letter quality printer, with a daisywheel is essential. If correspondence is only for invoicing and general customer liaison, as in the case of a scrap merchant, a chimney sweep, or someone running a dog kennels, then a dot matrix printer, faster and cheaper, will suffice. The printer is the item most likely to go wrong so those with a daisywheel may purchase a cheap dot matrix printer as a backup.

Finally, an old desk, fitted with a four-way electric socket, sawn to accommodate these items and hide the cables while still leaving space for jotting pad and anglepoise lamp, can be far more efficient, if less prestigious, then an expensive console from an office automation dealer.

Software?

What software is available and can help the small businessman do the tasks described above? I shall illustrate with software for my own system, based round a BBC model B Micro. Equivalents are cheaply available for many other models. The significant exception is the CP/M range which covers wider applications, has been proven over a longer period, but is more expensive. It will not be discussed here but those who anticipate activities substantially larger than a one-man business should study the benefits of a CP/M system from the outset.

Spreadsheet programs

Budgeting and forecasting probably prevent more crises than any other managerial technique. Plans of monthly activity are made years ahead and actual performance regularly compared with the plan. 'Variance' is easy to spot and its likely effect on the whole business calculated before, not after, damage is done. If he has budgeted and warned his bank manager that he will need an overdraft, the businessman stands a much better chance than if he wakes up to find a peremptory summons about his overdraft in the letter box.

Many activities can be covered. Use of manpower can be broken down by different skills, by cost centres or age or sex. A haulier can plan his vehicle utilisation, analysed by type or tonnage or depot. A sales team can lay out its targets, by product, territory or type of market.

The budget expresses such plans in financial terms, comparing wages and salaries, rent, insurance costs, raw materials, power, and a wide variety of other costs with the sales income they produce. Not only can it show the likely profit or loss at the end of the coming year, but also cash flow: the vital blood supply by which businesses live and whose short-term failure has often caused their downfall, as it did to even the legendary Freddie Laker.

Why does every business not plan in this way? Because these techniques take many, many man-hours and, once done, need to be recast perhaps time and time again to match changing policies or circumstances.

Beebcalc

A micro program to lighten such toil is 'Beebcalc' which I use from disk but is now available on a chip. It sets out a table of columns (up to 26) and rows (up to 50) into which the user can enter text or numbers. It allows him to alter the width of columns, to define how each entry is spaced and to use formulae to calculate any entry. The entire table can be recalculated either as required or whenever an alteration is made.

I can recall innumerable conversations when the managing director said to the finance director: 'Go away and see what happens if we reduce the cost of that and increase the sales of these.' The finance director would shuffle out looking pained and, twenty-four hours later (if we were lucky), reappear with the altered document. Too many changes and he reached resignation point! 'Beebcalc' reduces this

Spreadsheet display

exercise, once the basic budget is cast, to a couple of minutes and a wreath of accountant's smiles.

Criticisms include the lack of provision for a disk drive number in the filename so the file can only be loaded in the current drive. The User Guide does not warn that, when one of eleven routines is selected by pressing a single key, the caps lock must be engaged or the program appears to jam. The Guide also assumes the reader knows what a 'toggle' is. This small businessman thought it was something used by boy scouts. I would recommend compilers of micro guides to assume total ignorance of jargon among their readers. Otherwise the Guide is comprehensive and helpful.

The program could be used wherever data needs to be presented as a 'spreadsheet', such as the presentation of scientific and technical data, the execution of engineering or other calculations or the production of timetables or fare charts.

Wordprocessing

The benefits depend on whether a competent typist is already employed. If so, he may resist learning the word processor's full capability due to having less need for the increased speed and accuracy it offers. However, for the businessman who types with one finger it has great attraction.

During the past decade, hardware

COMPUTERISING YOUR BUSINESS

salesmen have tried to sell wordprocessors as if they were different machines from computers. One company still advertises: 'The wordprocessor that thinks it's a computer.' In fact, wordprocessing is best achieved by the simple insertion of a single chip into a standard micro, an operation any sensible handyman can do in five minutes.

View or Wordwise

I shall not give detailed accounts of what the chip can do: some have been published recently in this magazine. Instead I shall deal with the business impact, which software reviewers rarely cover. My BBC machine has a choice of two chips: 'Wordwise', produced by Computer Concepts Limited or 'View', from Acorn Computers, the manufacturers. Both chips can be in the machine at the same time, for different purposes. Most small businessmen would find Wordwise simpler to use and teach a secretary. Its main disadvantage is that editing can only be done in forty column mode. However, the menu includes a facility to preview eighty column mode (in which a sheet of A4 is printed) and, as one gains experience, makes editing simple.

With View one can edit in eighty-column mode, seeing the text exactly as it will appear from the printer. If there is slight eye strain from editing on small letters a switch to forty column will provide relief. 'View' treats the screen as a 'window' on the text and if lines are too long this may become confusing. It is even possible to be typing text behind the window frame, clacking away merrily, producing no visible effect.

The two systems are actually compatible. One can write text on Wordwise, save it on a disk, using the menu's spool facility, then load it into a wordprocessor equipped with View, with only small changes in editing needed. A similar procedure is possible in reverse.

The most important facility to the small businessman, which both offer, is called a 'Macro' on View and a 'Get File' on Wordwise. This command automatically pulls a file from the disk and passes it straight to the printer without it appearing on the screen. Thus, for example, a standard letter to a debtor, complaining about an unpaid account, might be held permanently on a utility disk. The operator types the names, addresses, sum owing and date, plus the simple command code. However there are problems in formatting when using these techniques. They need to be worked out carefully before being taught to another user or much frustration will occur.

The wordprocessor can make savings in printers' bills. For example, Terms and Conditions of Contract can be set up on the utility disk and automatically printed on the reverse side of quotations or tenders. In the past these were in standard format, often part of it quite irrelevant to the contract in question. But with the word processor only the appropriate paragraphs need be selected.

Spreadsheet example

NoRecycling Project Type of Small Industry	No. of fact.	Year	Capital $	Cost of $ in £	Single £	Factory £	Total Cost £
1 Compost Plant	1	1984	20000	16400	170000	186400	186400
2 Baling Machines	2	1984	850	697	13600	14297	28594
	2	1985	850	697	13600	14297	28594
	1	1986	850	697	13600	14297	14297
3 Scrap Metal Yard	1	1985	2450	2009	4000	6009	6009
4 Newspaper Recycling	1	1985	1000	820	5000	5820	5820
5 Glass Melting Plant	3	1984	1300	1066	0	1066	3198
	3	1985	1300	1066	0	1066	3198
6 Plastics Granulation	3	1984	4500	3690	0	3690	11070
	3	1985	4500	3690	0	3690	11070
7 Plastics Film Processing	1	1986	7900	6478	12400	18878	18878
8 Plastics Pelletizing	1	1986	18100	14842	10500	25342	25342
9 Textile Reprocessing	2	1984	9550	7831	0	7831	15662
	2	1985	9550	7831	0	7831	15662
	1	1986	9550	7831	0	7831	7831
10 Waste Oil Recovery	1	1985	6300	5166	0	5166	5166
11 Maintenance Workshop	1	1984	27000	22140	0	22140	22140
12 Advance Workshops	1	1985	23000	18860	0	18860	18860
13 Institutional Costs	1	1984	29900	24518	9300	33818	33818
	1	1985	29900	24518	9300	33818	33818
	1	1986	29900	24518	9300	33818	33818
Total 1984 (Germany)							158440
Total 1984 (Britain)							142442
Total 1985							128197
Total 1986							100166
Three Year Total							529245

One of the shortcomings of word processing on micros is in the field of underlining, heavy type and other variations of print text. Dot matrix printers offer a wide variety of typefaces but the word processing programs cannot always take full advantage of these. Daisywheel printers are even less flexible. However, the user who is ingenious and willing to play with the system far into the night can devise his own techniques. These will be peculiar to the combination of printer, processor and word processing chip in use so are not found in instruction books.

Bookkeeping and accounts

Two accounting packages from the same software house illustrate that not all the business software available is suitable or adequate. Gemini's 'Commercial Accounts' at first appeared simple, crisp and friendly. The user selects the accounting transaction from a menu and inputs data in answer to short screen prompts. The program lists these either as a journal or by individual account and will summarise the state of the bank balance, the history of the year and the VAT record.

My favourite impression, however, soon evaporated. I will list some of the reasons in details so that others may watch for them.

I pay no VAT, so was irritated to answer a VAT question (admittedly with a single keystroke) for every transaction. I would have liked to say 'No VAT' at the start and not be pestered thereafter.

For tax reasons, my financial year starts on 1 May. The program requires dates to be input with a month number which of course I cannot remember. MAR or APR would be far easier to use.

No attempt is made to sort transactions by date but such a facility is essential for lazy people like me, who stockpile chits for three months, but still need to present accounts in date order.

Notification of a cheque receipt duly cancels the outstanding debt but does not credit the bank account. A separate input is needed for this. Could not 'Have you paid it in? Y/N' be added to do both jobs with one input?

In particular, I greived that the 12 characters available to input the account name, were abbreviated to a mere five on the journal display because this prevented me 'bending' the system to overcome its worst fault of all. This is that it caters for only one profit centre, operating one single bank account, and provides no analysed management information. Businesses, even small ones, need costs and income to be sorted and allocated to profit centres and need to differentiate between expenditure which is tax-deductible and that which is not.

For the above reasons this program is quite inadequate.

'Cashbook' in contrast costs nearly four times as much and is a comprehensive and adequate accounting system. It offers no less than 80 predefined accounting codes, covering all probable cost centres of a conventional business. Receipts can be analysed into no less than twelve separate classifications and any single payment can be split into five.

This means that the microcomputer activity becomes an integral part of the 'cash-up and bank' routine at the end of each commercial working day. There is no need for separate pen and paper records because like transactions are batched together and a batch record printed to match the paying-in or cheque counterfoil.

The journal (of cumulative transactions under any account code) can be inspected on demand and the system contains an impressive array of checking routines (No-one would say too many who had ever hunted errors deep in the heart of a set of books.) Cash and bank balance checks are available as required.

The system proceeds to trial balance (making sure all the figures add up before worrying about how to present them) and, after final adjustment, a separate program is used to produce a balance sheet and a profit and loss account. There is provision for printing the results of a previous year alongside.

As it is designed for an average, conventional business anyone running a nudist colony or a crocodile farm might find that many redundant codes are provided that take an irritating time to skip. Young mothers running a nursery school would legitimately jibe at 'Wife's wages' and the countless codes for motor vehicles and 'plant'. The fundamental principle of the BBC Micro: 'Let the user define' might have been better for the detailed codes!

This would have avoided incongruities such as, (in this era when marketing strategies are vital to survival) allocating only four analysis codes to sales, yet an equal number for invested capital. Even a dozen user definable codes at the end would have provided for the quirk or feature that is critical to the individual business.

Too little help is given to the user who has no accounting background. It takes many months to digest such accounting jargon as 'accruals', 'assets' or 'WIP'. The program is a little curt. It could do more to comfort the novice. When you want to know where to enter the £1000 loaned you by Auntie Maud, to be confronted with 'CAPITAL INTRO (1)' is a little frightening!

Above all, I wanted a friendly nudge every time I was confronted with 'Debit (D) or Credit (C)'. OK for a payment into the bank account but how about offsetting the depreciation on a crashed, middle-aged Rover with a payment for half a new one from an insurance settlement?

So, even good software has its faults. However, if the reader is still determined, what other drawbacks should he be wary of?

Trial Balance 22/6/83

	Account	Debit	Credit
1	Sales (1)		40143.56
2	Sales (2)		45000.90
7	Opening Stock & WIP	3000.00	
8	Purchases (1)	31600.30	
9	Purchases (2)	17150.40	
12	Closing Stock & WIP		5000.00
13	Sundry Income		700.00
14	Wages	8430.20	
15	Wife's Wages	1200.00	
16	Rent & Rates	1748.02	
17	Heat Light & Power	624.90	
18	Telephone	1620.40	
20	Insurance	210.70	
21	Motor Expenses	2560.00	
24	Repairs & Renewals	740.00	
27	Sundry Expenses	910.40	
28	Accountancy	600.00	
29	Legal & Professional	150.00	
31	Finance Charges	5510.00	
32	Bad Debts Written Off	1268.60	
33	Vehicles — Dep'n	200.00	
35	Plant & Equip't — Dep'n	150.00	
36	Leasehold — Dep'n	100.00	
37	Sale of F/Assets	150.00	
47	Cash	555.64	
48	Bank (1)		34400.00
49	Bank (2)	587.92	
50	Freehold Property	20000.00	
52	Leasehold Property	30000.00	
53	Leasehold Property — Acc Dep'n		50000.00
56	Motor Vehicles	4000.00	
57	Motor Vehicles — Acc Dep'n		500.00
58	Plant & Equipment	2500.00	
59	Plant & Equipment — Acc Dep'n		500.00
60	Goodwill	2000.00	
61	Debtors & Prepayments	2000.00	
63	Creditors & Acruuals		9300.00
65	HP (1)		900.00
69	HP Interest Res (1)	100.00	
74	VAT I/P Tax	5163.00	
75	VAT O/P Tax		9063.00
76	VAT R'funds/P'ments	4400.00	
77	Captital A/C (1)		15000.00
78	Captital A/C (2)		5000.00
81	Captital Intro (1)		500.00
85	Drawings (1)	8600.00	
86	Drawings (2)	12000.00	
89	Long Term Loans		4000.00
90	Stock & WIP (BS)	5000.00	
	TOTALS	174830.48	175007.46

**** The accounts do not balance — check journal entries ****

Drawbacks and difficulties

Initially the computer will use much more time than it saves. It may take months for the operator to get the best from it and the training of new staff will be even more burdensome.

Secondly, the time required for anyone who is not an experienced typist to input information is longer than filling in a pay ledger by hand. However, this will improve with practice.

Thirdly, and a big disadvantage, one is committed to the computer. If it breaks down, the whole office comes to a halt. This often means that a service contract is necessary and these are extremely expensive.

It is essential to run in parallel with the manual system, preferably for a complete financial year. Otherwise errors or the omission of vital information in the early stage may jeopardise the final accounts.

In big business data processing circles there's a motto 'Garbage in — garbage out'. To apply computers to business systems, experienced men would say, 'Order your computer, do all the preparatory work on your office systems and then cancel the order for the computer'.

It is in the orderliness that the computer imposes on human muddle that some of the biggest gains are to be made. This applies particularly to the small businessman. Yet if this orderliness is not achieved, the fiasco of a computerised office system can be far more disastrous than any manual muddler could ever believe. Don't say I didn't warn you! END

BENCHTEST SPECIAL '84

YOUR ADVANCE COPY WHEN YOU SUBSCRIBE TO PCW

We realise that you'll all be queueing up to buy your copy of the BENCHTEST SPECIAL 84 when it appears on the bookstands in November, so we created an exclusive offer especially for PCW readers:

A years supply of PCW — your favourite magazine — delivered "hot off the press" straight to your front door.

Plus!! An advance copy of this year's latest Benchtest Special the most comprehensive collection of quality reviews — brought to you by PCW — the leading and most respected magazine in the market.

The Benchtest Special 84 is bigger and better than ever and covers 30 of the most exciting new micros available, researched in depth by PCW's expert team of reviewers and full of colourful illustrations to bring the machines to life!

The micros presented will cover the full range from hobbyist to business and include the most up to date machines just recently launched — such as the Apricot!

And all for just £12.50!!

To make the most of this special offer, simply tear off the special coupon opposite and fill out your subscription details on the form provided. Don't miss this exclusive offer!

THE MT80. SHAPED BY EXPERIENCE

You are looking at the sleek, ultra modern lines of the latest dot matrix printer from Mannesmann Tally; the people who probably have more experience in computer printers than just about anyone.

The MT80 is a high quality, low cost 80 column, 80 cps printer that will complement any of today's micros in looks and quality; in either the home or the office.

It has been designed with industry-compatible interfaces in hardware and software.

Experience tells us exactly what you want from a printer – The MT80 has dual density dot addressable and line graphics. An easy change, long life cassette ribbon. It can handle both tractor-fed fanfold and single sheet paper. There is a unique quick tear facility giving you a clean cut along the entire width of the paper. And it even has an optional sound reduction kit for those of you who like to hear yourselves think.

But best of all, it comes equipped with another valuable asset. A very attractive price tag.

Contact your nearest distributor or send for our colour literature.

Mannesmann Tally Limited,
Molly Millars Lane, Wokingham, Berkshire
RG11 2QT. Tel: (0734) 788711. Telex: 847028

MANNESMANN *TALLY*
CREATING THE RIGHT IMAGE IN PRINT

U.K. DISTRIBUTORS C.K. SUPPLIES LTD., WESTON-SUPER-MARE (0934) 515805/516246. DATRON MICRO CENTRE, SHEFFIELD (0742) 585400. MELLORDATA, COLCHESTER (0206) 298181. RIVA TERMINALS, WOKING (04862) 71001. IRISH DISTRIBUTOR CARA DATA COMMUNICATIONS, DUBLIN 429666.

FX SYSTEM

continued from page 177

major drawback in this system becomes apparent — to someone used to the familiar instruction set of, say, the Z80 or 6502, the instructions for using the FX Computer are a little strange, to say the least. Granted, anyone who works his way through this manual will gain a good theoretical understanding of the use of a computer at machine language level, but specific knowledge gained from this system is unlikely to be directly transferrable to another system. It would have been far better to have used a more familiar processor.

But maybe this is unjustified carping — after all, this system is not designed to be used as a home computer, and it has very little user memory available. As a glance at the memory map will show, available memory is limited to the area between 00 and 4F for program storage, and 50-5F for data storage — it makes the unexpanded ZX81 look positively generous as far as free memory goes.

Memory

There are four registers — A,B,Y and Z together with the alternate registers A', B', Y' and Z', known as A-prime, etc (see Memory map). The manual leads the user gently through the instruction set, starting with the most important registers, A and B. There are six commands for manipulating these, although the mnemonics look a little strange to anyone who has spent any time on a more conventional machine — TIA uses two characters of code, and moves the second character to the A register; CH is used to move a number from A to B; KA transfers the key value to the A register; AIA adds two numbers, storing the result in the A register; JUMP changes the program flow and occupies three addresses, with the second and third holding the address to be jumped to.

The Group 2 commands manipulate the memory — addresses 50-5F — which is used for data storage; Group 3 commands manipulate the Y register, generate short sounds and light up the binary LEDs pointed to by the value in the Y register; Group 4 commands lead onto more complex register handling and more sound routines.

The manual is extremely helpful in teaching the user exactly what happens at 'machine level' — each group of commands has a set of related exercises and experiments, and, in particular, the methods used by computers to multiply and divide by binary addition and subtraction are made very clear. The games that accompany the descriptions are hardly taxing, but then the physical attributes of the computer do not exactly lend themselves to complex displays.

Memory map

memory	00-4F		program memory
	50-5F		data
registers	A (6F)	A (69)	
	B (6C)	B (67)	
	Y (6E)	Y (68)	
	Z (6D)	Z (66)	

Conclusions

It's not easy to come to a definite conclusion about the FX System. There's much to recommend it in terms of ease of learning, and I was particularly impressed with the electronics side. I can see that an 11-year-old child, for example, would soon gain a good grounding in simple electronic theory by working his or her way through the manual and doing the relevant experiments. I'm not so sure about the computer part of the set-up — although in principle it is a very good idea to teach the very basics of machine code programming and instil a working knowledge of how a computer works at register level, the fact that the model used is hardly standard and can handle only seven bit numbers is a distinct drawback. This is especially apparent now that the cost of 'real' computers has plummeted drastically: the special ZX81 offer of computer plus 16k RAM pack for £45 means that for £25 less than the cost of this system it is possible to purchase a computer that uses standard Z80 mnemonics and which connects to a TV display. Throw in another few quid for a book on machine code programming and you'll have a system that will be of much more real use and benefit than the FX Computer.

So this system is really sold on the strength of the electronics — and good though these are I am sure there are plenty of other 'Teach Yourself Electronics' kits that will fulfil the same function at a cheaper price. Full marks for construction, ease of use and the concept behind this system, then, but I remain unconvinced of its relevance to the 'real' world.

Prices

FX computer and electronic component kit £69.95 inc VAT
Post and packing £3.00
Details from Electroni-Kit Ltd., 388 St John Street, London EC1V 4NN. END

APPLES AND PAIRS
STRUCTURED BASIC FOR THE APPLE

continued from page 222

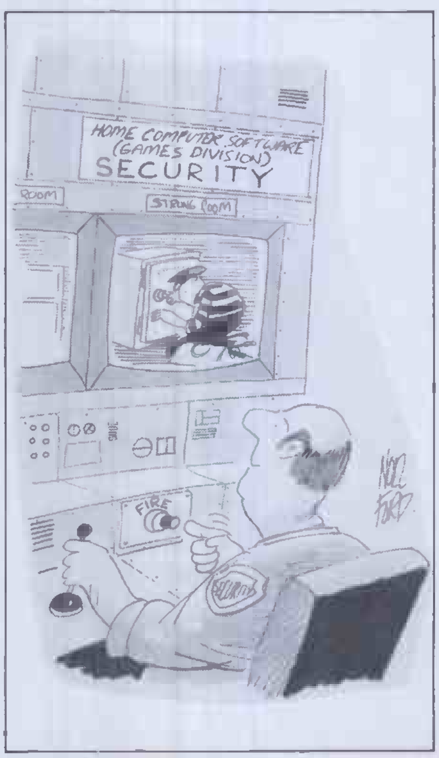
student notes, technical reports even diaries get indexed routinely (note in passing that Screenwriter for the Apple does make a limited attempt at this: but don't try to index several chapters of a book on separate disks!).

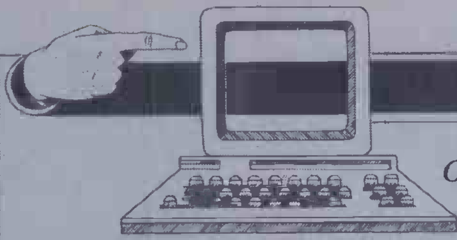
This Apple-based structured Basic should not be confused with that produced by Sensible Software some time ago. That did have some of the advantages of this package, but it was a pre-compiler. Once a program had been written it had to be saved onto disk before conversion to ordinary (rather difficult to follow) Applesoft. If you then had a fault the source code had to be reloaded before editing. It has few of the advantages of using standard UCSD Pascal but does have the disadvantage of not being directly interpreted. Nor does it have the all important ability to declare local variables within a procedure.

Conclusions

In conclusion, the advantages of this version of structured Basic for the Apple far outweigh the small disadvantages. It makes it easier to write programs. Once written programs are easier to understand, and easier to improve. A pool of procedures can be quickly built up, and by virtue of local variables are easy to include in other programs, even if written by someone else. Something which will endear it to schools, universities and other institutions. Worth every cent, those that use it will find it a much more significant development in the Apple orchard than the Apple IIE.

END





IN STORE

Our bi-monthly guide to microcomputing systems. Updates should be sent to: Tracy Dear, PCW, 62 Oxford Street, London W1A 2HG.

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
ABC 26 (£4500)	AI 09237-70578(19)	64k RAM: Z80A: dual 8" F/D (2.3Mb): 12", 24 x 80 VDU: 2 x RS232 ports: 3 x P/P	CP/M: *MP/M Basic: Cobol: Fortran: Pascal.*	Options: 10Mb H/D £4000. BT 4/81 (S).
ABC 80 (£738)	Datormark Ltd: 97 44896	16-40k RAM: Z80A: C: 12", 16 x 40 b&w VDU: 4680 bus: IEE 488: RS232 port.	DOS Basic (16k ROM: *Fortran: Pascal: A: Multi user Basic.*	Colour video graphics with UHF output. Viewdata compatible. Loudspeaker. Numeric keypad. Options: dual 5¼" F/D (320k) £895: dual 8" F/D (2 Mb). BT 1/80. (1)
Acclaim (£3650)	Country Computers 0527 29826	64k RAM: Z80: 24x80 VDU: single 5¼" F/D (140k): 5 MB H/D: RS232 port. Option: P/P	CP/M: *Basic: Cobol: Fortran: Pascal*	Various integral H/D options up to 21MB (£4450)
ACT Sirius 1 (£2395)	ACT 021 501 2284 (50)	128-512k RAM: 8088: dual 5¼" F/D (1.2M): 12", 25 x 80 VDU: 2 x RS232 ports: 2 x P/P	CP/M 86: U: Basic 86 *Cobol: Fortran: Pascal*	High res graphics. Options: 10 Mb H/D: dual 5¼" F/D (2.4 M) BT 2/82.(S)
Adler Alphatronic (£1895)	Adler 01-250 1717	48-64k RAM: 8085A: dual 5¼" F/D (1Mb): 12", 24 x 80 VDU: S/P: P/P	CP/M: *Basic: CBasic: Fortran: Cobol*	With 80 cps printer and dual F/D £2345 (inc CP/M). (S)
Altos ACS 800-2 £2995)	logitek: 0257 426644 (33)	64k RAM; Z80A; dual 8" F/D (1 Mb): 2 x RS232 ports: 2 P/P.	CP/M: *Basic: CBasic: Cobol.*	Single user. Options: DMA. Floating point processor. Phototyping board.
Altos ACS 8000-10 (£6675)	As above.	280k RAM: Z80A: single 8" F/D (500k): 10 Mb H/D: 6 x RS232 ports: P/P: network RS422 port: DMA	CP/M: *MP/M: Basic: Cobol: Fortran: APL: Pascal.*	Multi-user/multi tasking. Up to 4 users. Options: 10 Mb: mag tape backup (S + H).
APL Signet (£1750 or £130pm)	Micro APL: 01-834 2687	64k RAM: Z80A: dual 5¼" F/D (380k): 2 x RS232 ports.	CP/M: APL: *Basic: U: Fortran: Cobol: Algol: Forth*	Desktop APL computer with self teaching course. (S)
Apple II (£695)	Apple (UK) 0442 60244 (200+)	16-48k, RAM: 6502: 8 I/O slots.	OS: Basic: *Pascal: Fortran: Cobol: Pilot*	280 x 192 high resolution graphics: Option: single 5¼" F/D (116k) £349.
Apple III (£2496)	As above	128-256k RAM: 6502B: dual 5¼" F/D (286k): 12", 24x80 VDU: RS232 port: P/P.	SOS: *Basic: Pascal:*	Options: single 5¼" F/D (143k) £384: 5Mb H/D £2256. (I) BT 5/82
Atari 400 (£200 inc VAT)	Atari UK: Slough 33344	16k RAM: 6502: C int: cartridge slot: 24 x 40 TV int: touchpad k/b: Opt: C £50	OS (10k ROM): *Basic (8k ROM). Pilot: A:*	High resolution colour graphics. 4-channel sound. Four games controller/light pen sockets. BT 10/80. (I/B).
Atari 800 (£500 inc VAT)	As above.	16-48k RAM: 6502: C int: 2 x cartridge slots: 24 x 40 TV int: Opt: single 5¼" F/D (90k) £300: 16k RAM £65.	OS(10k ROM) Basic (8k ROM): *Pilot A: Forth: MBasic* (I/B).	As above. Software & RAM on cartridge modules. Up to 4 disk drives RS232C int £135. BT 10/80.
Atom (£120)	Acorn: 0223 245200 (160)	2-12k RAM: 8-16k ROM 6502: Full K/B: C int: TV int: 20 I/O lines: 1 P/P. Options: 80 col printer £199, Prestel adaptor £120.	Basic in 8k ROM: A Cass O/S: *Lisp: Forth*	High resolution graphics on bigger model: Single 5¼" F/D £297 B/ 7/80 (B)
BASF 7120 (£4400)	BASF: 01-388 4200 (12)	88k RAM: 2xZ80A: 3 x 5¼" F/D (480k): 12", 24 x 80 VDU: RS232 port: P/P	DOS: (OASIS) *Ex Basic: Cobol U. A: CP/M*	H/D available. Also 7125 with *960k* F/D £4900 and 7130 with single F/D (430k) & 5Mb H/D £6300. Disk controller has own Z80A. BT 9/80
BBC Micro (£299 inc VAT)	BBC Micro Systems 0933 79300	16-32k RAM: 32k ROM 6502: C int: TV int: RS423 port: P/P: Option: single 5¼" F/D (100k) £230	MOS: Basic A: *Pascal, Logo: Forth: Lisp*	Video text & second processor int. 32k model with Econet and disk interface £399. BT 1/82 (I)
Bonsai SM3000 (£1995)	Bonsai 01-580 0902	64k RAM: Z80: dual 5¼" F/D (700k): 12", 24x80 VDU: RS232 port: P/P	CP/M: *Basic: Cobol: Pascal: Fortran*	Many floppy and hard disk options. Applications software avail. from Bonsai.
Computers Lynx (£225 inc VAT)	Computers Ltd 0223 315063 (TBA)	48-192k RAM: Z80A; 24x40 TV int: C int: RS232 port	Basic	248 x 256 colour graphics (8 colour). CP/M compatible 5¼" F/D & printer avail soon. (B)
Canon BX-3 (£3000)	Canon 01-680-7700.	32k RAM: 6809: dual 5¼" F/D (640k): 28 char display: 80 cps printer: 3 x RS232 port: P/P.	OS: Basic: A. *Cobol: Pascal*	Fully integral unit. Extensive applications support offered on all Cannon Machines. Options: dual dual 5¼" F/D (640k) £1500.
Canon CX-1 (£2500)	As above.	32k RAM: 6809: dual 5¼" F/D (640k): 12", 24 x 80 VDU: 3 x V24 ports: P/P: light pen.	OS: Basic: A: *Cobol: Pascal*	Price includes installation & training. Extensive application support offered. Options: dual 8" F/D (1Mb) £3300.(S)
Canon TX-25 (£1450)	As above.	16-32k RAM: 6809: C: 20 char display: 26 col, 2.4 lps printer. Option: 2 x RS232 port.	Basic: A	Fully integral unit. Cassette is Cannon's own design (8k). Can be used with communications. (S).
Clenlo Pronto (£2825)	Clenlo Computing Systems Ltd: 01-670 4202 (TBA)	64k RAM: Z80: dual 8" F/D (1 Mb): 3 S/P: 2 P/P.	CP/M: CBasic-2: Pearl 1: *U Fortran: Cobol: Pascal*	With 2.4Mb F/D £3105. Also H/D systems with 5-20 Mb H/D & tape drive £5430.

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor's (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Cleno Table Top 525 (£1750	As above	64k RAM: Z80 dual 5¼" F/D: 2xS/P	CP/M: MBasic: W/P	Wordstar & Logicalc included in price. Many options
Colour Genie (£200 inc VAT)	Lowe Electronics 0629 2430 (100+)	16-32k RAM: Z80: 16k ROM: C int: 24x40 TV int: Audio port: RS232 port: P/P	ExBasic	160x96 colour graphics. 16k RAM £30. Many options inc joysticks and light pen. F/D avail soon. (B)
Columbia PC (£2800)	Icarus 01 485 5574 (50)	128k RAM: 8088: dual 5¼" F/D (640k): 24x80 VDU: 2xRS232 ports: P/P: 8 expansion slots	MS-DOS: *CP/M 86: Basic: Cobol: Fortran: Pascal*	IBM PC compatible. With integral H/D (5 Mb) £4200 or (10 Mb) £4550 (S)
Comart Communicator (£1895)	Comart 0480 215005 (25)	64k RAM: Z80A: dual 5¼" F/D (780k): 2 S/P: P/P.	CP/M: *MP/M Basic: Cobol: Fortran: Pascal*	With 1.5 Mb F/D £2195. With 4.8 Mb H/D & 790k F/D £2995. Option: 18 Mb H/D. £3895 Also CP100 range with 8086 & 128k-1Mb RAM from £2295. Expandable to multiuser/multitasking. (S).
CommodorePET 16k, & 32k (£550, £695)	Commodore: 0753 79292 (150)	16-32k RAM: 6502: C: 12" 25x40 VDU: IEEE-488 port: Options: dual 5¼" F/D (343k) £695: same but (1018k) £895	O/S: Basic (in 8k ROM): *Forth: Pilot: Pascal: Comal: Lisp: A*	CBM 8032 with 80-col screen (32-96k) BT 12/80. £895 Field service avail. (1).
Commodore Vic 20 (£200 inc VAT)	Commodore: 0753 79292 (150)	5-32k RAM: 6502: Cint: 22 x 23 TV int: S/P: P/P: Games int.	Basic	Graphics 3 tone sound generator. Will interface to PET. Option: single 5¼" F/D (170k). BT 9/81(S).
Commodore 500 Series (From £659)	As above	128-896k RAM: 6509: 25x40 TV int: P/P	O/S: Basic: *CP/M: Pascal: Forth: Cobol: Fortran*	High res. 16-colour graphics. Second processor option: Prestel facility avail.
Commodore 700 Series (From £995)	As above	128-896k RAM: 6509: 24x80 VDU: Option: dual 5¼" F/D (1Mb): IEEE-488 port: RS2332C port.	As above	8088 or 280 second processor option Tilt and swivel screen.
Commodore 64 (£299)	As above	64k RAM: 6509: 25x40 TV int: C int: RS232 port: P/P	Basic	Second processor option. 320x200 colour graphics. Option: Joystick: Light pen
Compucorp 625 (£6000)	Compucorp: 01-907 0198 (17)	48-60k RAM: Z80: dual 5¼" F/D (630k): 9". 16x80 VDU: 40 col printer: RS232 port, P/P.	Basic: A: *Fortran: Pascal:* U	IEEE-488 Controller and S100 int. Many applications packages avail. (E).
Compucorp 655/665/675/685 (from £5050)	As above	60k RAM:. Z80: Up to 4x5¼" F/D(160k-2.4 Mb): 9", 20x80 or 12" 20x80 or 20" 60x80 VDU: 40-col printer: RS232 port.	As above	Prices incl installation and training. Opt: 10-20 Mb H/D
Cromemco System Zero/DDF, System 2, System 3, System Z2H. (£1975/£3095/£4495/£6585)	Datron: 0742 585490. Comart: 0480 215005 (25) MicroCentre: 031-556 7354 (18)	64k RAM: Z80: dual 5¼" F/D (390k) on System Zero, System 2 & Z2H: dual 8" F/D (1.2 Mb) on Sys 3: 10 Mb H/D on Z2H: S/P: P/P.	CDOS: *Basic: Cobol: Fortran: RPG II: Lisp: A: W/P: Multi-user Basic. Cromix. CP/M*	System 2 & 3 expandable to Multi-user (max 7) Also 'D' series with 6800/Z80A dual processor from £3620. Options: dual 8" F/D (996k): 11.2Mb H/D. BT 10/79 (E).
DAI (£595)	Data Applications (UK): 0285 2588 (7)	48k RAM: 8080: C int: 24x60 VDU int: RS232 port: over 20 industrial ints. option: dual 5¼" F/D £595	Basic (ROM): U	Colour graphics up to 255 x 335: 3 notes & noise generator: PAL O/P to TV: Paddle int: H maths option. (1). BT 10/80.
Diablo 3000 (£6250)	Business Computers Ltd: 01-207 3344	32k RAM: 8085: dual 8" F/D (1.3 Mb): 12", 24x80 b&w VDU: 45 cps printer.	DOS: Basic: DACL: A: U.	Selection of business packages included (S).
Digital Micro-systems DMS-3 (£3530)	Digital Microsystems 0734 343885 (14)	64k RAM: Z80A: dual 8" F/D (1.14Mb): 3xRS232 ports: 1xRS422 port: P/P.	CP/M: CBasic: *Cobol: Fortran: Pascal: PL/I*	Expandable to multi-user system with 10-28 Mb H/D. Extensive software avail. (S).
Digital Micro-systems DMS-4 (£4395)	As above	128-512k RAM: Z80A: single 8" F/D (500k): 11 Mb H/D: 4x RS232 ports: P/P.	CP/M: Basic-E: CBasic: *Cobol: Fortran: Pascal.*	Port expander to enable up to 10 workstations under M/PM. Options: 128k RAM £1295: up to 96Mb H/D. (H).
Dragon 32 (£200 inc VAT)	Dragon Data 0792 580651 (50+)	32-64k RAM: 6809E: 16x32 TV int: C int: P/P	Basic	9 colour 256x192 high resolution graphics. Option: Joysticks BT 8/82
Durango F-85 (£4995)	Comp Ancillaries: 0784 36455 (12)	64k RAM: 8085: dual 5¼" F/D (1 Mb): 9", 16x64 green VDU: 132 col 165 cps printer: N/P.	O/S: D Basic: *CP/M: CBasic: Micro Cobol.*	Up to 5 work stations: fully integrated system. Options: additional dual 5¼" F/D (1 Mb): 12-24 Mb H/D.(S).
Eagle II, III and IV (from £2350)	Mediatech Bus Syst 01 903 4372	64k RAM: Z80A: dual 5¼" F/D (768k and 1.5Mb) or single 5¼" F/D (784k) with 10Mb H/D: 2xRS232 ports: 2 x P/P	CP/M: CBasic: *Cobol Pascal: Fortran*	Many different configurations available. Full range of applications software
Epson HX20 (£402)	Epson	16-32k RAM: 32k ROM: Twin 6301 CPU: 20x4 LCD: RS232 port: Micro dot matrix printer	E Basic	Display gives 120 x 32 dot graphics. Options: TV int: micro-cassette drive: expansion module. BT 12/82
Equinox 200 (£7500)	Equinox: 01-739 2387 (N/A)	64-512k RAM: Z80: 10 Mb-1200 Mb H/D: 6xS/P: 1 P/P.	CP/M: CBasic: *Cobol: Fortran.*	Multi-user MVT/FAMOS available in place of CP/M. 16-bit version (Equinox 300) £10,000. (S&H).
Fortune 32:16 (£4375)	Fortune Systems 01 938 1721	256-512k RAM: MC 68000: dual 5¼" F/D (800k): 12", 25x80 VDU: S/P: P/P	FOS: *CP/M: Basic: Pascal: Cobol: Fortran: C*	Expandable to full multi-user system. High res colour graphics
Gecas 64/2 (£3305)	Grecas Micros 01 629 3758	64k RAM: Z80A: dual 8" F/D (2.4 Mb): S100 bus.	CP/M: Cobol: *Basic Pascal Fortran*	Up to 4.8 Mb F/D. Expandable to multi-user/multitasking system.

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

YOUR LOCAL COMPUTER SHOP
OFFERS 30 DAY MONEY-BACK GUARANTEE

Whether you're shopping for a home computer or software for your existing machine Rumbelows are the only shop to let you try it at home and, if it's not exactly what you want, to return it for a full refund. Not only that but we offer free insurance and free service for a year.

COMMODORE 64 Home Computer. **64K** memory capacity. Built-in synthesizer and hi-fi output. 16 colours on screen. High resolution graphics.

PRICE WINNER £229·99

Easy terms available.

FREE!
C2N CASSETTE PLAYER.
NORMAL PRICE £44.99

TEXAS 16K Home Computer T1994A. Normal Price £149.99

PRICE WINNER £99·99

Easy terms available.

SINCLAIR Spectrum **48K** Ram Home Computer. Life action keyboard with silent moving keys. Includes free demonstration cassette with 14 pre-recorded programmes.

PRICE WINNER £129·99

Easy terms available.

FREE!
ANY 5 CASSETTES FROM OUR RANGE WORTH £49.95

ALSO AVAILABLE

SINCLAIR Spectrum **16K** Ram.

PRICE WINNER £99·99

FREE!
5 CASSETTES

COMMODORE VIC 20 Home Computer. Easy to operate with a wide variety of programmes available. Simple connection to TV set via aerial socket.

PRICE WINNER £139·99 Easy terms available.

FREE

STARTER PACK
WORTH OVER £70
IDEAL FOR BEGINNERS

- Cassette Player
- Introduction to Basic part 1
- 4 game cassette

DETAI
AND WRITTE
QUOTATIO
FOR CREDIT TERM
AVAILABLE FROM AN
RUMBELOWS BRANC
OFFERS SUBJECT TO AVAILABILIT
PRICES CORRECT AT TIME OF GOING T
PRESS. REDUCED PRICE ITEMS ARE LOWE
THAN OUR NORMAL PRICE BUT MAY NO
HAVE BEEN SOLD AT A HIGHER PRICE FO
A PERIOD OF 28 CONSECUTIVE DAYS IN TH
PREVIOUS 6 MONTHS. HEAD OFFICE: TRINITY HOUS
TRINITY LANE, WALTHAM CROSS, HERTS. EN8 7E

[TYPICAL APR 41.2%]

RUMBELOWS

We save you money. and serve you right.

UP TO £750 INSTANT CREDIT
SUBJECT TO STATUS. ASK FOR DETAILS.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Gemini Multiboard (£500)	Micro Value 02403 28321(7)	64k RAM: Z80: 25 x 80 VDU int (with Z80): Option: dual 5¼" F/D £690.	CP/M: *Basic Cobol: Pascal Fortran AP/L:*	Modular system. Other options inc ROM board & EPROM programmer. BT 2/82 (H&S).
Gemini Galaxy 2 (£1495)	As above	64k RAM: Z80A: dual 5¼" F/D (800k): 12", 25x80 VDU: RS232 port: P/P: C int	CPM: *Basic: Cobol: Fortran: Pascal: AP/L: A*	Options: dual 5¼" FD (800k): dual 8" F/D (2.4Mb)
Gimix System 68 (£2000)	SEED: 05433 78151: Windrush 0692 505189	16-64k RAM: 6800/6809: dual 5¼" F/D (500k): 2xRS232 ports.	OS-9: Flex *Basic: Pascal: A: Dis A: T/E:U*	With dual 8" F/D (2 Mb) £2900. Designed as development system for industrial control. (H).
Genie I (£299)	Lowe Electronics: 0629 2430 (N/A)	16k RAM: Z80: 500bps C: 16 x 64 TV int: extra C int: 1 P/P	Basic (12k ROM): *Pascal: A M/A: Fortran*	Options: single 5¼" F/D (184k) £220; dual 5¼" F/D (368k) £375 (I) Also Genie II with numeric keypad and function keys but no cassette (same price as I).
Genie III (£1900)	As above (26)	64k RAM: Z80A: dual 5¼" F/D (1.25 Mb): 24x80 VDU: RS232 port: P/P	NewDOS 80: *CP/MZ: Basic: Cobol: Fortran Pascal*	System complete with business applications software, maintenance contract and choice of printer £3250 (S).
Grundy 8200 (£1850)	M-Tech Comp Serv. 0603 870620	64-256K RAM: Z80A: dual 8" F/D (2MB): 24x80 VDU: RS232 port: P/P	CP/M: *Basic: Cobol: Fortran: Pascal: Forth: PL/1: Ada*	Various hard disk options up to 26MB
Haywood 9000 Composite (£1795)	Haywood: 01-428 0111. (TBA)	64-192k RAM: Z80A: dual 5¼" F/D (640k): RS232 port: P/P. 15" 28x80 VDU.	CP/M: *Basic: Cobol: Fortran: Pascal: W/P.*	Graphics avail. Expandable to 18 Mb H/D. Networking version planned (H&S)
Haywood Hinet (£7500)	As above	64k RAM: Z80A: dual 8" F/D (2Mb): 11Mb H/D: RS232 port: RS422 port: P/P. 24x80 VDU	CP/M: HiNet: *Basic: Cobol: Fortran: Pascal*	Local area network, up to 32 users. Range of H/D avail. Local disks & printers if required. Work station £2050 (H&S)
HP 75C (£728)	As above	16-24k RAM: 48k ROM: CPU: 32 char display: mag card reader	Basic	8k RAM £142. Video interface £221. Thermal printer £371. (E) BT 11/82
HP 85 (£2013)	Hewlett Packard Ltd: 0734 784774 (16)	16-32k RAM: C.P.U.: 5", 16x32 VDU: C(200k): 64 cps printer: 4 P/P. Options: dual 5¼" F/D (540k) £1610: fusl 8" F/D (2.4 Mb) £4108.	Basic (ROM)	Full dot matrix graphics. Complete range of interfaces, peripherals and application packages avail. 16k RAM £142. (S).
HP86 (£1314)	As above	80k RAM: C.P.U.: 48k ROM. Options: 12", 24x80 VDU £238: 9", 16x80 VDU £216: 5¼" F/D (207k) £622	ExBasic	Many expansion possibilities including CP/M module (£362), RS232 port (£289) and up to 576k user RAM. 400x240 graphics. BT 10/82 (E)
HP 125 (£2479)	As above	64k RAM: 2xZ80A: 12", 24x80 VDU 2xRS232 ports: HP-1B port. Options: dual 5¼" F/D (500k) £1693	CP/M: Basic: *Cobol Fortran: Pascal*	Integral thermal printer £629. Also available with dual 8" F/D (2 Mb). (S). BT 3/82
IMS 5000 (£1500)	Equinox: 01-739 2387 (20)	16-56k RAM: Z80: dual 5¼" F/D (320k): 2xS/P: 1 P/P:	CP/M: C/Basic: *Cobol, Fortran.*	3 drives option: (S&H).
IMS 8000 (£2500)	As above	64-256k RAM: Z80: dual 8" F/D (1 Mb): 2xS/P: 1 P/P	CP/M: CBasic: *Cobol: Fortran: MicroCobol.*	Multi-user MVT/FAMOS available in place of CP/M. (S&H).
Jupiter Ace (£90 inc VAT)	Jupiter Contab,	3k RAM: 8k ROM: Z80A; 24x32 TV int: C int: loudspeaker.	Forth	Has 140 Forth words defined in ROM.
Kemitron K2000 E (£2300)	Kemitron 0244 21817 (3)	64k RAM: Z80A: single 5¼" F/D (150k): 12", 24x80 VDU: 2xS/P: P/P	CP/M: *Basic: Cobol: Fortran Pascal: A*	Extensive range of support cards and industrial interfaces.
Kemitron K3000 E (£3300)	As above	64k RAM: Z80A: dual 8" F/D (2Mb): 2xS/P: P/P	CP/M: MP/M: *Basic: Cobol: Fortran: Pascal: A*	Up to four screens and four printers can be attached. Options: 10Mb H/D.
LSI M-Two (£6000)	LSI Computers 04862 23411 (20)	64-128k RAM: 8085A: dual 8" F/D (1.2 Mb): 12", 24x80 VDU: 60 cps printer.	Elsie: *CP/M: Basic: Cobol Fortran: Pascal: A: U*	Max 8 VDUs and 4 printers. Many applications packages available. Option: 10 Mb H/D £2600. (S)
LSI M-Three (£1700)	As above	64k RAM: Z80A: dual 5¼" F/D (350k): 12", 24x80 VDU: RS232 port: P/P	CP/M: *Basic: Cobol. Fortran: Pascal: A*	Option: Dual 8" F/D, 10 Mb H/D (E)
LSI M-four (£2175)	As above	128-256k RAM: Z80B: 8088: dual 5¼" or 8" F/D 3xRS232 ports: RS422 port: P/P 12", 24x80 VDU	MS-DOS: *CP/M-86 Basic Cobol: Fortran: Pascal: MP/M-86*	Operates on either 8-bit or 16-bit applications software. Option: 10 Mb H/D
Macro 1 (£3950 or £294 pm).	Micro APL Ltd. 01-834 2687 (TBA)	64k RAM: Z80A: dual 8" F/D (1 Mb): 4xRS232 ports.	CP/M: APL: U: *Basic: Fortain: Cobol: Word-2star Algo: Pascal: Forth.*	Designed as timesharing replacement. Macro 2 with 2 Mb F/D £4750 or £334 pm.
Marinchip M9900 (£4990)	Microprocessor Eng. 0703 775482	128k RAM: 9900: dual 8" F/D (2Mb): 4xRS232 ports.	NOS: Basic: Pascal: W/P: *SPL: Forth: Meta*	Multi-user/multi-tasking OS. Options: H/D up to 120 Mb.
Micro Trainer 1 (£650)	Hewart: 0625 22030 (N/A)	16-32k RAM: 6800/6809: 10" 16x24 VDU: 2xC int: Opt: dual 5¼" F/D (160k) £595: 8k RAM £17.	Basic: A: *Pascal: PL/M: W/P*	SS50-based system. Graphics avail. Int card with real time clock £17. (1).
Millbank Sys 10 (£2395)	Millbank: 01-891 4691(6).	65k RAM: Z80: dual 5¼" F/D (700k): 12", 24x80 VDU: 2x RS232 ports: RS449 port: P/P.	CP/M: *Basic: Cobol: Fortran: Pascal: PLI: W/P.*	12-month warranty. Mainframe comm. package. Maintenance contracts. Options: 1.6 Mb F/D. 5-50 Mb H/D. (S&H)
Munroe EC8800 (£2150)	Fi-Cord Int. 061 445 7716	128k RAM: Z80A: single 5¼" F/D (320k): 3xRS232 ports: P/P	Munroe Multitasking System: *CP/M: Basic: Cobol: Fortran: Pascal*	High res colour graphics. Option: single 5¼" F/D. (320k). £495

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

YOUR PARENTS DID THEIR BEST FOR YOU...WILL YOUR CHILDREN BE ABLE TO SAY THE SAME?

"Now...I've got two oranges in my left hand and one in my right, how many oranges...?"

In the last five years, the microchip has extended its revolutionising influence to our schools. Today, even the youngest classes take computers as much for granted as we did our wooden rulers.

With these implications in mind, Good Housekeeping Software was created; its aim being to develop a comprehensive range of carefully structured early learning software for your home computer.

A NEW WAY TO PLAY AND LEARN

Designed not just by software specialists, but also by educational experts, each package goes far beyond the popular image of computer assisted learning.

It provides a framework for you and your child to learn and play together. It also encourages your child to discover the rewards of independence and concentration as he or she explores the program alone, or with a friend.

Each package includes games. But unlike most other software for children, these are neither trivial nor competitive. They are designed to encourage learning through structured play, colourful eye-catching graphics of the highest quality, and a variety of realistic sound effects.

You can also adjust the speed and difficulty of each game to suit your child. Or let the computer adjust itself automatically as your child progresses.

LEARNING WITH MR T

Mr T, Good Housekeeping's lively animated character, will help your children explore all sorts of previously difficult educational areas. Now they can l to tell the time, or cope with real money, in an excitin entertaining way.

Mr T will also help your children come to ter with the whole idea of computers as an integral part their future lives.

THE PARENTS' HANDBOOK

A parents' handbook is included in each packa containing simple operating instructions and a step-by guide to help you and your child get the best out of program. It also contains a wealth of follow-up activ for you both to enjoy away from the computer.

YOUR CHILDREN'S FUTUR BEGINS HERE

Put your home computer to w for your children now. Send for your Good Housekeeping Early Learning packages by cutting this coupon.

Hardware compatibility BBC Micro B (O.S 1.0. or above) Sinclair Spectrum 48K. Dragon and Commodore 64.
Available at leading computer stores and specialist compu departments of major high street retailers.

To: Ebury Software, 72 Broadwick Street, London W1V 2BP.
Please send me the Good Housekeeping software package(s) that I have indicated.

		BBC Micro B (O.S 1.0 or above)	Sinclair Spectrum 48K
Mr T tells the time	£12.95 each		
Mr T's money box	£12.95 each		
Mr T's alphabet games	£12.95 each		Available 1984
Mr T's number games	£12.95 each		
Mr T's measuring games	£12.95 each		
Mr T's shape games	£12.95 each		
	Total		

Dragon and Commodore 64, versions available 1984.
I enclose my cheque/P.O. for the amount above including VAT and P & P, made payable to Ebury Software. Or charge my Access/Visa/Diners/American Express.

A/C No. ____

Signed ____ Date ____

Name Mr/Mrs/Ms ____
(Block letters)
Address ____

Total number of packages ordered ____

Remittance should be made payable to Ebury Software and shall be he behalf in this account until the goods are despatched. Please allow days for delivery. Offer applies to U.K. and Eire only.
Ebury Software (a division of the National Magazine Co Ltd).
Registered number 112955.

GOOD HOUSEKEEPING SOFTWARE · EARLY LEARNIN

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Munroe OC8820 (£2990)	As above	128k RAM: Z80A: dual 5¼" F/D (640k): 9", 24x80 VDU: 3xRS232 ports: P/P	As above	5MB H/D avail soon. BT 4/82.
Nascom 3 (£549)	Lucas Logic 0926 59411	48-60k RAM: Z80: dual 5¼" F/D (700k): RS232 port: P/P.	Basic: *Pascal: A: CP/M: Cobol Fortran*	Options dual 5¼" F/D (700k) £685: 48k RAM £130.
NEC PC 8001 (£599)	IBR 0734 664111	32k RAM: Z80A: P/P Option: dual 5¼" F/D (326k) £699	Basic N: (24k ROM) *CP/M: Fortran: Cobol: Pascal.*	Colour monitor £359 (low res) or £579 (high res) both 12", 25x80 many expansion units avail. (E) BT 6/81
Newbrain Model A (£199)	Grundy: 0223 350355 (TBA)	32k-2 Mb RAM: Z80A: Nat 420: 2xC int: TV int: 2xV24 ports.	CBasic (29k ROM): A.	Graphics. Battery or mains. Options: ½ Mb RAM £450. Also Model AD £299.(E).
North Star Horizon (£1975)	Comart: 0480 215005. (25) Trader Comp. 01-328 3484 (60)	32-64k RAM: Z80A: dual 5¼" F/D (360k): 15", 24x80 VDU: 150 cps printer: 2 S/P: 1 P/P.	DOS: Basic: CP/M: *Cobol: Fortran: Pascal.*	Options: 5-18 Mb H/D, Multi-user.
North Star Advantage (£2195)	As above	64k RAM: Z80A: dual 5¼" F/D (720k): 12", 24 x 80 VDU: S/P.	GDOS: CP/M: *CBasic: MBasic: Fortran: Cobol: Pascal*	Price includes business graphics & demo software.
Oki if 800 (£3000)	Encotel. 01 686 9687	64k RAM: Z80A: 2k ROM: dual 5¼" F/D (768k): 12", 24x80 VDU: 80 col printer: loudspeaker: RS232 port: 20k ROM cartridge.	Basic: A: *CP/M Cobol: Fortran.*	Fully integral unit. Graphics. Options: dual 5¼" F/D (560k): RS232 port: PP. (I). BT 10/81
Olivetti M20 (£2395)	Olivetti 01 785 6666	128k-512k RAM: Z8001: 2-8k ROM: dual 5¼" F/D (640k): RS232 port; P/P	Basic: *PCOS: A*	Alternative 8086 processor board to run CP/M86 & MS-DOS. Options: 11 Mb H/D (integral): printer £738. (S) B/T 9/82
Onyx C8000 (£6875)	Onyx Dist Ltd: 09066-5432 (TBA)	64k RAM: Z80: 12 Mb Cartridge: 10 Mb H/D: 4 S/P: P/P	CP/M: *MP/M Oasis: Unix: Fortran: Pascal: W/P*	C8001 with 128k RAM £8220. Multi-user version avail. using Oasis.(E) BT 3/81.
Oric 1 (£100 inc VAT)	Oric Products Int 0990 27641	16-48k RAM: 6502A: 28x40 TV int: C int: S/P: P/P: Loudspeaker	Basic (16k ROM): *Forth*	With 48k RAM and Forth on cassette £170 inc VAT. 240x200 colour graphics. Micro disk and modem avail soon. Viewdata compatible.
Osborne 1 (£1250)	Osborne 0908 615274(40)	64k RAM: Z80A: dual 5¼" F/D (200k): 5", 24x52 VDU: RS232 port: P/P	CP/M: W/P: *Cobol: Fortran: Pascal* CBasic: MBasic: Wordstar: Mailmerge: Supercalc *Forth*	Integral system in weatherproof carrying case. Will run on battery pack. Option: dual 5¼" F/D (400k). BT11/81.
Oscar (£2560)	IDS Ltd: 0908 313997(30)	64k RAM: Z80: dual 5 ¼ F/D (800k): 12", 25x80 VDU: RS232 port: 1 P/P	CP/M: *Basic: Pascal Fortran: Cobol: W/P:A*	Also avail. with dual 5" F/D(1.6Mb) £2905 and 8" F/D(2 Mb) £3380. Advanced video board. S&H).
Panasonic JD 800M, JD850M (£3300, £4350)	Panasonic Business Equipment: 0753 75841 (10 regional dist)	64k RAM: 8085A: 4k PROM: dual 8" F/D JD800M (500k): JD850M (2 Mb): 12" 24x80 VDU: 3xRS323 ports: P/P	CP/M: Basic: A *Micro-Cobol.*	Option: 8.4 Mb H/D £2725 (up two). BT3/80(S).
Pascal Microengine (£2295)	Pronto Electronic Systems Ltd: 01-554 6222	64k RAM: MCP 1600: 2x RS232 ports: 2 P/P.	Pascal.	CPU instruction set is P-code: no interpreter needed. Available with dual 8" F/D (2 Mb) £3900.
Pasca 640 (£1900)	Westrex Ltd: 01-578 0957 (TBA)	64k RAM: Z80A: dual 8" F/D (512k): 12", 24x80 VDU: RS232 port: P/P	CP/M: *Basic: Cobol: Fortran: Pascal: A: W/P: U*	Maintenance contracts avail. Option: 5-20 Mb H/D. (S) BT 5/18
Philips P2000 (£2444)	Philips Data	16-48k RAM: Z80: dual 5¼" F/D (140k): 12", 24x80 VDU: RS232 port.	PDOS: UCSD p-system: *Pascal: Basic Fortran:A.*	With 48k RAM, Pascal and Basic £3300: BT 12/81.(S).
Position 900 (£1950)	Position Comp. 09252 29741 (10)	64-512k RAM: 6809: 4xRS232 ports: IEEE-488 port: 1200 band C: dual 5¼" F/D (720k)	OS-9: Basic 09: *Pascal: C: A: Cobol: U FLEX O/S*	Supports 4 users, expandable to 8. Networking allows 28 users on 7 Options dual: 5¼" F/D (1.4 Mb): 5-40 Mb H/D (E)
Position 9000 (£1536)	As above	64-512k RAM: 6809: 4xRS232 ports: IEEE-488 port: 1200 band C.	OS-9: Basic 09: *Pascal C: A: Cobol: U*	240x240 high res colour graphics. Viewdata compatible. Disk options as above. Supports 5 users. Networking allows 35 users on 7 systems (E) BT 10/82.
Prince (£3045)	Digico: 04626 78172 (50)	64k RAM: 3xZ80A: dual 5¼" F/D (800k): 2xRS232 port: P/P 12", 25x80 VDU	CP/M: *Basic: Pascal: Fortran: Cobol: W/P:A:* T/E:U	High res graphics. Options: single 5¼" F/D (400k) £600: dual 8" F/D(2 Mb) £2000 5-10Mb H/D. Rentals avail. (S).
Quantum 2000 (£2250)	Quantum Comp Sys 0532 458877	64k RAM: Z80A: dual 8" F/D (2.4Mb): 12", 24x80 VDU: C int: P/P	CP/M *Basic: Cobol: Fortran: Pascal: A*	Many expansion boards avail inc high res colour graphics. Option: 5-10Mb H/D.
Rair Black Box 3/30 (£3750)	Rair: 01-836 6921 (N/A)	64-512k RAM: 8085: dual 5¼" F/D (500k): 6 Mb H/D: 2xRS232 ports.	CP/M: Basic: Cobol: Fortran: M/A	64k RAM expansion £500. 256k RAM £1250. Up to 16 RS232 ports.
Research Machines 380Z (£1867)	Research Machines: 0865 249866 (N/A)	32-56k RAM: Z80A: dual 5¼" F/D (300k) RS232 port. P/P.	ExBasic: A: T/E: U: *CP/M: Fortran: Cobol: Algol: Pascal.*	High res colour graphics. Many possible systems. With 56k RAM & dual 8" 'FD (1 Mb) £3347.
Research Machines Link 480Z (£560)	As above	32-64k RAM: Z80A: C: 2xS/P: P/P	Basic: T/E	High res colour graphics. Network station.

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software Items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Sage II (£2870)	TDI 0272 742796	128-512K RAM: 68000: single 5¼" F/D (320k): VDU int: RS232 port: P/P	UCSD p-System: Pascal Basic: Fortran: M/A	Price includes 1 year service. With 512k RAM and dual 5¼" F/D (1MB) £4594 BT 2/83
SEED System 1 (£1900)	Strumech: 05433 78151 (5)	32-56k RAM: 6800: various disk options: 12", 24 x 80 VDU: RS232 port: P/P	DOS: Basic: *M/A: CBasic: A: T/E*	Graphics. PROM programmer Also system 19 multi-user (£3000). (E)
Sharp MZ-80K (£460-34k)	Sharp Electronics (UK) Ltd: 061-205 2333 (22)	6-48k RAM: Z80: C: 10" 24 x 40 VDU: Option: dual 5¼" F/D (289k) £695	Basic, A. *CP/M: Pascal: Fortran: Forth*	Graphics: loudspeaker. BT 10/79 (B)
Sharp MZ80A (£549)	Sharp Electronics (UK) Ltd 061 205 2333 (22)	48k RAM: Z80: 25x40 VDU: C: P/P. Options: single 5¼" F/D £400: dual 5¼" F/D £590: RS232 port	Basic: *CP/M: A: Pascal: Fortran: Cobol*	Expansion unit needed for disks (£100) Low res (80x50) graphics. Loudspeaker Numeric pad (B)
Sharp MZ-80B (£1095)	As above	64k RAM: Z80A: C: 9", 25 x 80 VDU: RS232 port: P/P.	Basic: *A: Pascal: FDOS*	High res graphics. Options: dual 5¼" F/D (560k) £800: 80 cps printer £415. (S)
Sharp PC1500 (£150)	As above	3-11k RAM: CPU: 16k ROM: 26 char LCD	Basic	Full system with dual cassette int. and miniature four colour plotter £375. RS232 port avail. soon. (B). BT 6/82
Sharp PC3201 (£2995)	As above *CP/M: Cobol*	64k RAM: Z80A: dual 5¼" F/D (500k): C int: 12", 25 x 80 VDU: 70 lpm printer.	DOS: U: Basic: *CP/M: Cobol.*	Various expansion cards avail. BT 7/81 (I&B)
Sharp PC1251 (£80)	As Above	3k RAM: 8-bit CPU: 24 char LCD	Basic (24k ROM)	Portable. Printer/cassette unit £100 BT 2/83
Sig/Net 100ZS (£1299)	Shelton 01 278 6273 (5)	64k RAM: Z80A: dual 5¼" F/D (400k): 2xRS232 ports	CP/M: *Basic: Cobol: Fortran: Pascal*	Various disk options, up to 16 Mb H/D
Sinclair ZX81 (£50 inc VAT)	Sinclair: 0276 66104 (300+)	1-16k RAM: Z80A: C int: TV inb: full K/B: 44-pin expansion port.	Basic (8k ROM).	Advanced 4-chip design. Printer now avail. BT 6/81
Sinclair ZX Spectrum (£125 inc VAT)	Sinclaire 0276 685311	16-48k RAM: Z80A: 16k ROM: T.V. int: C int	Basic	Options: 32k RAM £60. RS232 port and microdrive disks avail soon. BT 6/82
Smoke Signal Chieftan (£1800)	Windrush 0692 405189: (TBA)	32-64k RAM: 6800/6809: dual 5¼" F/D (500k): 2 x RS232 port.	DOS: *68/FLEX: Basic: Fortran: Cobol: A: Disc A: Pascal: U.*	With daul 8" F/D (2 Mb) £2600. Designed as development system for industrial control. (H).
Sorcerer (£790)	EMG 0293 519211 (27)	48k RAM: Z80: RS232 port: 1 P/P: S100 connector: 30x64 VDU int. N/P.	O/S: Basic (ROM): *A: Algol: Fortran: MBasic: ExBasic: 80. Pascal: W/P.*	High-resolution graphics capability: user programmable character set, Option: single 5¼" F/D (316k) £600 Video disk unit (1.5Mb) £1890
Sord M100 ACE (£2339)	Midas Computer Services Ltd: 07917 64686 (10)	48k RAM: Z80: 8k ROM dual 5¼" F/D (245k): 24 x 64 green VDU: RS232 port: N/P	O/S: Basic: *A: Fortran: Pascal.*	Up to 3 drives possible. Colour graphics avail. Option S100 bus. (I)
Sord M223 Mk II-VI (£4078)	As above	64k RAM: Z80: 8k ROM: dual 5" F/D (700k): 12", 24 x 80 green VDU: RS232 ports: S100 bus: N/P	*O/S:* Ex Basic: *CBasic: Multi-User Basic: Fortran: Cobol*	Expandable to 4 Mb F/D. 32 Mb, H/D, 5 screens, 2 printers. M243 with 192k RAM & 1.4 Mb F/D £5087.
SPC/1 (£3140)	Digital Data: 01-57[illegible]854	96-1056k RAM: 8085 A-2: dual 5¼" F/D (280k): 12", 24 x 80 VDU: 2 x RS232 ports: Option: Up to 106 Mb H/D	Mikados, Comal: Pascal: A.	Expandable to multi-user system (8 users). BT 7/80 (S).
Superbrain (£1750)	Icarus: 01-485 5574 (45)	64k RAM: 2 x Z80: dual 5¼" F/D (320k): 12" 25 x 80 VDU: 2 x RS232 port.	CP/M: A: *Basic: Cobol: Fortran: APL: Pascal*	Limited graphis, Mainframe int avail. With 676k F/D £2090, 1.5Mb £2345. With 5Mb H/D & single 338k F/D £3950. BT 8/80. (S&H)
SWTPc/09 (£3850)	SWTP Ltd 0733 234433	64k RAM: 6809: dual 5¼" F/D (1.5MB) 2 S/P: P/P: 12", 24 x 80 VDU	Flex O/S: Basic: A: T/E	Expandable to 768k RAM
SWTPc S/09 (£7000)	As Above	128k RAM: 6809: dual 8" F/D (2.5MB) 2 S/P: 1 P/P	Uniflex O/S: *Cobol: Basic: Fortran: C.\Pascal: A: Pilot: Forth.*	Up to 80MB H/D. Multi-user, multi-tasking, up to 18 users.
System 10 (£2995)	Millbank 01-788 1083 (TBA)	64k RAM: Z80: dual 5¼" F/D (700k): 12", 24 x 80 VDU: 2 x RS232 port: P/P	CP/M: *Basic: Fortran: Pascal: Cobol: PL/1: W/P*	12 month warranty. Maint. contracts. Applications packages avail. Choice of high level language in price. (E)
Tandberg EC10 (£3250)	Tandberg: 0532 774844 (N/A)	64k RAM: 8080 A: single 8" F/D (250k): 12" 25 x 80 VDU: 7 x RS232 ports: printer int.	CP/M: Ex Basic (24k) *Multi-user Basic: Pascal: Cobol: A:* U:	Up to 7 terminals. Includes V28 comms port. (S&H)
Tandy PC-2 (£179 inc VAT)	As above	3-11k RAM: CPU: 16k ROM: 26 char LCD	Basic:	System with dual cassette int. and miniature four colour plotter £338 inc VAT. RS232 port aval. soon. (B)
Tandy TRS-80 Model 1 (£174)	Tandy: 0922 648181 (200)	16-48k RAM: Z80: C: 12", 16 x 64 VDU: RS232: P/P	Basic (12k ROM): A.	Fully expandable. Option: single 5¼" F/D (175k) £320 (up to 4). Many extras available. 32k RAM £260. (I)
Tandy TRS-80 Model II (£2347)	As above	64k RAM: Z80: single 8" F/D (500k) 12" 24 x 80 VDU: 2 x RS232 port: P/P	Basic *M/A Fortran: Cobol* 3-32 Mb H/D	Option: single 8" F/D (500k) £782 (subsequent £391, up to 4). 8-32Mb H/D
Tandy TRS 80 Model 3 (£434-£1477)	As above	See Model I Levels I and II		Fully integral unit. Up to 2 integral and 2 external 5¼" F/D. BT 8/81

List of Abbreviations

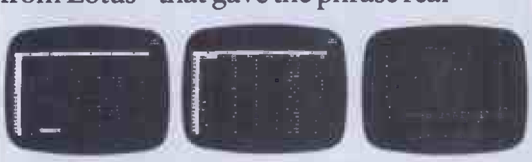
A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

Introducing 1-2-3 from Lotus. The first software that works as fast as you do.

You may have heard already about totally integrated software.

But the fact is that it was 1–2–3™ from Lotus® that gave the phrase real



1 Spreadsheet 2 Information Management 3 Business Graphics

meaning. Because we combined spreadsheet analysis, information management, and business graphic functions on one disk.

You can switch from one function to another instantly.

In fact, as you work with it, it seems faster.

What about 'What ifs'?

The speed of 1–2–3 from Lotus makes it a powerful ally for your mental and management skills.

But the real magic is that it's designed to let the human mind work at its optimum levels, because the thought process is not interrupted by the mechanics of changing disks.

You can speculate, forecast and exchange variables from one function to another in seconds.

To the novice, 1–2–3 makes everything plausible. To the expert it makes anything possible.

In short 1–2–3 from Lotus is a superior management tool that makes you even more efficient than you are today.

With its speed and your skill it's wonderful to contemplate what you could accomplish.

Lotus

Please tell me where I can see Lotus 1–2–3 demonstrated.
Send to: John Weatherhead, Reflex Limited, Wellington Industrial Estate, Basingstoke Road, Spencers Wood, Reading RG7 1AW. Tel: 0734 884611.

Name__________

Business__________

Address__________

PCW/11/83

Lotus

The hardest working software in the world.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Tandy TRS-80 Colour (£209)	As above	16-32k RAM: 6809: 8-16k ROM: C: 16 x 32 TV int: RS232 port.	Colour Basic.	With 16k RAM, 16k ROM & Extended Colour Basic £261 (I). BT 9/81.
Tandy TRS-80 Model 16 (£3651)	As above	128-512k RAM: Z80A 68000: dual 8" F/D (1-2Mb): P/P: 2xRS232 port.	TRSDOS: A: *Cobol Basic*	Will run all Model II software. System with single 5¼ F/D (600k) and 8Mb H/D £5911. Options: 8Mb H/D £2173 (up to four): 640x240 high res graphics: Multi-user system avail. soon. (S)
Tele Video TS800 (£3100)	Colt 01-577 2686	64k RAM: Z80A: dual 5¼" F/D (700k):P/P: S/P: 24x80 VDU: 80 cps printer.	CP/M: *Basic: Cobol: Fortran: Pascal*	Fully expandable to local area network with 16 users. 8 and 16 bit versions avail. and full set of application software. (S)
Terodec PBM-1000 (£4020)	Terodec: 0734 664343 (40)	80k RAM: Z80A: single 5¼" F/D (819k): 6Mb H/D:2xS/P: P/P	CP/M CP/Net CBasic: *Fortran: Pascal: Cobol*	System with Okidata 80 printer: TVI 910 VDU: W/P and various application packages £5995 (S&H)
TI 99/4A (£199 inc VAT)	TI: 0234 67466 (TBA)	16-48k RAM: 26k ROM: 9900: 2 x C int: 24 x 32, 16 colour TV int: 3 tones & noise: P/P.	OS: Basic.	12 month guarantee. Options 32k RAM: 2 x RS232: 3 x 5¼" F/D (92k each): Speech Synthesiser.
Torch (£12795)	Torch Comp. 0223 841000 (30)	64k RAM: Z80A: dual 5¼" F/D (800k): 12", 24x80 colour VDU: RS232 port: P/P: Modem	CPN: BBC Basic:	O/S is CP/M compatible. With 21MB HD and single F/D £5495. B/T 1/83
Tuscan CP/M Starter (£999)	Transam: 01-405 5240 (N/A)	24k RAM: Z80: single 5¼" F/D (190k): Cint: TV int: RS232 port: P/P: N/P.	CP/M: *Basic: Fortran: Pascal: Cobol:*	Options: single 5¼" F/D (190k) £155: single 5¼" F/D (370k) £285: 16k RAM £162: 3 Mb H/D £1450: 20 Mb H/D £2970 (S&H)
Tuscan Starter Kit (£299)	As above	8k RAM: Z80: Cint: 56-key K/B Options: Case £110: 5 x S100 sockets £20: TV int £3.50	8k Basic	Fully assembled version £499 BT 1/81 (H&S)
Vector MZ (£2650)	Almarc: 0602 52657 (3)	56k RAM: Z80A: dual 5¼" F/D (630k): 3 S/P: 2 P/P.	CP/M: Basic: *Algol: Cobol: Pascal: Fortran: Coral: CBasic: A.*	High resolution graphics. Also system B with video board & terminal £3450. (E)
Vector System 2800 (£4600)	As above	56k RAM: Z80A: dual 8" F/D (2.4 Mb): 3 S/P: 2 P/P	As above	High-res graphics. Many Options. Fully expandable to 5005 multi-user system (max 5) £5400.
VIP (£2650)	Almarc 0602 52657 (3)	64k RAM: 3k ROM: Z80B: single 5¼" F/D (630k): 12", 24 x 80 VDU: RS232 port, 3 x P/P	CP/M: *Basic: fortran: Cobol: Pascal: A.*	Up to 3 additional F/D drives. Options: dual 8" F/D (2 Mb) £1063, 32 Mb H/D (TBA). (H&S). BT2/81
Windrush 6809 (£2418)	Windrush 0692 405189	56k non-volatile CMOS RAM: 6809: 2xRS232 ports: 2xP/P: dual 5¼" F/D (700k)	OS-9: *Flex: Uniflex Basic: A: PL9: SPLM: Cobol: Fortran: Pascal*	Designed as development system for industrial control/computer station for commercial OEM's. With dual 8" F/D (2 Mb) £2953. (E)
Xerox 820 (£1845)	Business Comp Sys 01 207 3344	64k RAM: Z80: single 5¼" F/D (162k): 12", 24 x 80 VDU: 2 x RS232 ports: P/P	Monitor: *CP/M: Basic: Cobol: Fortran: Pascal.*	With 8" F/D (500k) £2250. CP/M £95. BT 1/82 (S + H)
Zenith WH-11A (£2673)	Zenith Data Systems 0452 29451 (TBA)	LSI 11: 16-32k RAM: 25 x 80 VDU: S/P: P/P.	*O/S: Basic, Fortran: A: U.*	PDP 11-compat. Option: 2 x 8" F/D (1 Mb). £1717 (S&H).
Zenith Z89 £1570-£1710	As above	16-48k RAM: Z80: single 5¼" F/D (102k): 12" 24 x 80 b&g vdu: RS232.	*Basic: A: HDOS: CP/M: MBasic: CBasic: Fortran.*	3 x 5¼" F/D possible. Options: dual 8" F/D (1 Mb) £1717, 20 Mb H/D.
Zilog MCZ 1/05 (portable): MCZ 1/20A (£3250)	Thames Systems: 084421 5471 (N/A)	64k RAM: Z80: dual 8" F/D (600k): RS232 port: MCZ 1/20A only 1 P/P: Option: 10 Mb H/D £7100	RIO: O/S: *Cobol: Basic: Fortran: Pascal: M/A: U.*	Available desk top or rack mounted. Debug in 3k PROM. 1/20A runs multi-user Cobol, up to 5 terminals with 40 Mb H/D. (S&H).

TRANSACTION FILE

Readers will be pleased to know that, due to our clever layout ideas, the Transaction File is up-to-date and waiting cut down considerably. Ads are accepted only on the form below for a flat fee of £2.50. Please don't specify issues as we can't oblige. Ads cannot be repeated unless separate forms are sent in. We will only accept entries from non-commercial readers. Thank you for cooperating.

● Video Genie, Interface to parallel printer (eg 3016). little used, new £35, will accept £15. RAM for Video Genie, 8 chips, 2k byte each, new. £4. Tel: Longfield (04747) 5165.

● PET 4016, 32k, with cassette, cover + lots of software inc Assembler, Word-Pro, various games, Memfix, etc, all manuals, boxed and in excellent condition, £300 ono. Tel: Ashford (Kent) 37227.

● NewBrain AD and Microline 80 printer for sale, £170 and £180 respectively; both still under guarantee and in good condition. Don't waste this chance. Tel: 01-691 2190 any time after 6pm.

● Apple II Europlus, 48k with disk drive (Dos 3.3) + software, including Wizardry, Appleworld and Dos toolkit, £700 ono. Tel: Stamford (Lincs) 56708 (eve).

● Sharp MZ-80K, 48k RAM, Basic, Sharp Assembler, Knights Commander, Pascal, Forth, Fortran and Machine Code. 120+ programs, £300 ono. Tel: Stevenage (0438) 65952 after 6.30pm or weekend.

● VIC-20 computer + cassette recorder + 16k RAM + super expander cartridge + joystick + £80 software, cost £400+. only £2[illegible] Tel: 0227-79 3486.

● Sharp MZ80A, 48k, new On 1982, Sharp manuals, 8 Sharp software cassettes, 8 Kuma software cassettes, £399. Could deliver in Yorkshire. Gifford, 43, Cotswold Drive, Garforth, Leeds. Tel: 864694.

● Apple II Europlus, disk drive, language card, Silentype printer, 14in BMC green screen, games software, Snapshot. £900. Richard Blach. 88a College Road, Dulwich, London SE21. Tel: 01-693 1917.

● Digital cassette recorder, suit any 6502 micro. £60. Extension RAM card for Atom, £50. Tel: Cambridge (0223) 355957.

● Atom 17k expansion RAM card complete with connectors, £50. Currah digital cassette, 60k storage, 6000 baud transfer rate + connectors and tapes for Atom, £60. Hitachi monitor, £50. Tel: 0223 355957.

● Hewlett Packard HP85A. 40k, portable, HP-IB interface, input/output ROM, built-in printer and high speed cartridge, £1000 ono. Tel: Tim on 01-240 0085 (day) or 01-720 6350 (eve).

● VIC-20, 2 months old, still in original packing + many magazines and Basic book, instruction manual. price £90, bargain, ono. Reason: owner lost interest. Barrett, Whiston, Liverpool. Tel: 430 7855.

● Sharp MZ80K, 48k with Basic, manual, games cassette including Space Invaders and Cosmiads, newsletters, dust cover, perfect condition, £250. Tel: 0202 694643.

● Gemini Galaxy 2, 64k, twin 5¼in disk drives. CP/M 2.2OS, Cis Cobol, Comdas (Pascal), complete with manuals, 8 months old, package worth £2,500, accept £2,000 ono, inc carriage. Tel: 061-881 8582.

● 32k Buffer for Apple II to Epson (parallel), £80. Apple to Epson parallel interface, £50. Unused Supercalc for Sirius, £110. Tel: 0844 52719.

● Sharp MZ80A, 48k, in perfect condition with Basic manual and Basic tutorial cassette, £60 worth of software (games, home finance, etc), £325 ono. Roy Frost, 15 Warren Road, Blundelsands, Liverpool L23 6UA.

● Tuscan S100, 48k static RAM, 80x24 VDU, one 380k DS/DD 5in drive, CP/M FDos in ROM. Contact Don on Bradford (0274) 684253.

● PET, 32k, 3000 series, cassette, reset button, addressable Centronics I/F; manuals: PET revealed, PET graphics; software: games, Pascal language, Assembler, will deliver SE. £250 ono. Tel: Farnborough 548419 after 6pm.

● Tandy 48k computer/ wordprocessor, Model I, complete with manuals, £300, green monitor screen, £50, printer interface, £10, Tandy printer LP VII, £120, all together £450. Tel: Stock (0277) 840569 (Essex).

● NewBrain AD, 32k, £199, under 12 hours use; also Sanyo 12in high resolution monitor with anti-glare screen, green, £90, hardly used. Tel: Bristol 690345.

● Sharp PC1500 with printer cassette interface (CE150), 8k RAM (CE155) and applications tape (CE14A), in good condition, current cost minimum £390, my price £275. Tel: John on 01-546 6991 after 6pm.

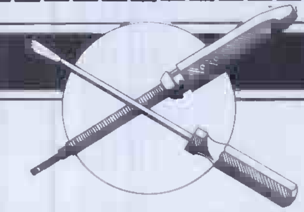
TRANSACTION FILE

TRANSACTION FILE ADVERTISEMENT FORM

All Transaction File ads must be submitted by readers on this form or a photo-copy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by a flat fee of £2.50. Make cheques or POs payable to Personal Computer World. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send form to: Transaction File PCW, 62 Oxford Street, London W1A 2HG.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

ACC NEWS



Rupert Steele presents his monthly round-up of news from the Amateur Computer Club.

At the time of going to press a proposal is going before the ACC's AGM at the end of October to re-structure the ACC. The idea is that the organisation will be adjusted to reflect the dual roles of the ACC as a group of hardware hackers and a national liaison body for the local clubs and national user groups.

It is proposed that the two organisations will be administratively separated. The Amateur Computer Club will continue to communicate between its members via ACCumulator, and the Association of Computer Clubs will have an administrative role. The intention is that the Association of Computer Clubs will ultimately be run by a Council composed of elected delegates from the Clubs and User Groups around the country. The new body will be genuinely democratic and under the control of the people it represents.

A postal consultation of local clubs is being run at the moment, to try to get some feedback on the idea. If you've been asked for a view (or even if you haven't) please send it to me *now*, or it will be too late . . .

Club Spot 800 is growing fast with lots of pages coming from LASERBUG. You can get your club on Prestel, too. We will put up a display page for you saying who you are, *or* you can learn to edit and put up your own material. Write to me for more information; we also have some nice deals going for new editors (but note that editing is expensive on phone bills unless you are local to London, or can get somebody else to pay . . .).

Micronet is taking off well (remember Micronet is *800#, Club Spot is *8008#). In a year's time, I believe Micronet will have a third of total Prestel users. I believe that interfaces for Sinclair machines should soon be available, as well as the BBC.

Continuing in a telephone vein, I am told of a conference at the University of Leeds, Department of Computer Studies, entitled *Micro-Computer Communications*. This is (provisionally) to be held on 30/31 March, 1984 at the University. There will be a number of invited speakers. Meanwhile, the organisers are sending out a call for contributed papers. Further details and conference application forms are available from the Conference Chairman, Professor Kenneth Smith, Dept of Computer Studies, The University, Leeds LS2 9JT.

User group news

An independent user group has recently been formed by users of the Osborne 1 microcomputer. 'The British Osborne Owners' Group' (BOOG) is the officially recognised UG for Osborne. It will have a regular newsletter, the *BOOG Information Exchange* (BOOGIE). There will also be a bulletin board run by Osborne. The group is happy to accept non Osborne members using CP/M on other machines.

Osborne owners should write to BOOG, Dr & Mrs J D Anglesea, Flat 19 Rowan House, Mitton Road, Handsworth, Birmingham B20 2JR.

Also new is NILUG, the National Independent Lynx User Group. This group was set up with ACC support some months ago and is now producing a good newsletter called *NILUG NEWS*. The subscription is £9 and the chap to contact for more information is Robert Poate, NILUG, 53 Kingswood Avenue, Sanderstead, South Croydon CR2 9DQ. Go on, support your user group; you never know when it may be helpful.

AT LONG LAST...

Adult Video & COMPUTER Games!

WORLD'S FIRST
2 in 1
Playaround adult
video games
TWICE THE SPICE

available now.

ATARI 2600.

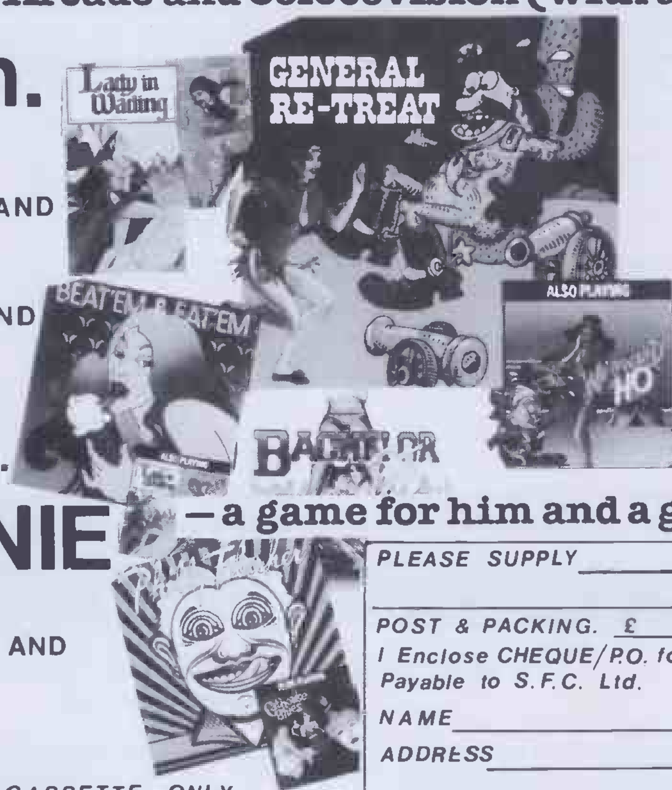
201 Cathouse Blues. – Philly Flasher
202 Burning Desire. – Bachelorette Party
203 Knight on the Town. – Jungle Fever
204 Beat 'em and Eat 'em. — Lady in Wading
205 Bachelor Part. — Gigolo
206 Westward Ho. — General Re-treat

*** 6 cartridges – 12 games available now**
*** Fits Atari, Sears, Video Arcade and Colecovision (with adapter).**

ZX Spectrum.

CASSETTE ONLY 16 or 48K.

101. SOHO Adventure. AND SEX Invaders.
102. Cathouse Blues. AND Philly Flasher.
103. Gigolo. AND Beat em & Eat 'em.



General Retreat
Another stimulating ga of love and chance whe you send your 'soldier o fortune' across tricky terrain to make love to a lively princess. Your soldier will lose a turn (i more ways than one) if is struck by a cannonba assaulted by a prickly cactus but if he makes it the graphics and sound effects will indicate the fact. (On a double tape with 'Westward Ho').

2 games in
– a game for him and a game for he

TRS 80./GENIE

CASSETTE 16k DISK 48k

301. SOHO Adventure. AND SEX Hunt.

BBC. mod 'B'

CASSETTE ONLY

401. FLASHER. AND "FATE" (worse than death) Adventure.

PLEASE SUPPLY ______
POST & PACKING. £ ______
I Enclose CHEQUE/P.O. for £ ______
Payable to S.F.C. Ltd.
NAME ______
ADDRESS ______
POST CODE ______
VISA
OR Debit my Access/Barclaycard
(Delete as necessary)
We welcome Acce

Cassette. 7·99 – Disk. 9·99 – Cartridge. 29·50 – Postage. 90p. eac

WRITE NOW – OR – TELEPHONE YOUR ORDER QUOTING Access/Visa No. (24hr Service)

Silver Fox COMMUNICATIONS Ltd.

P.O. BOX 16, CLACTON ON SEA, ESSEX. Tel: (0255) 422034

The UK's Only specialist 'ADULT' software distributor. TRADE ENQUIRIES WELCOME

WANTED New ADULT GAMES and Game Ideas.

ACC NEWS

Clubs: Giovanni Mello of Via S Floriano 3, 31049 Valdobbiadene, Treviso, Italy, writes to me 'I am an Italian computer fan: I have a NewBrain mod AD and I founded a little club of about ten members.

'Unfortunately this computer has not yet a great diffusion in Italy, so we have difficulties in finding software for it.' Giovanni would like to contact English NewBrain owners for exchange of software and information.

A more assured Mr C Benito of PO Box 3253, Madrid, Spain, tells me 'We're the best ZX Users' Club in Spain. We edit monthly a newsletter 30-40 pages each. We teach free Basic courses each week. We meet every day (!) from 6 to 7.30pm. We have an interchange of programs. We even have our own PET 'ZX Captain.'

Peter Mortensen, of Skovvangsvej 8, DK-8370, Hadsten, Denmark, writes to find out about us. He runs a computer club in Hadsten, so anybody who's going that way might like to drop a line . . .

Mr A M Sharta, of Texaco Nigeria Limited, 241 Igbosere Road, PO Box 166, Lagos, Nigeria, is setting up a computer club. I don't know if it is Texaco employees only or whether it's open to a wider group of foreign employees in Lagos.

Similarly, Mr Maawiah H Abdullah of Sultan Hassanal Bolkian Teachers' College, Bandar Seri Bagawan, Brunei, is setting up a computer club. I have a separate letter from Capt A D Griffiths of the Royal Brunei Malay Regiment, Studies Centre, Bolkiah Camp, Bandar Seri Begawan, Brunei, BFPO 605, who is setting up a computer club.

Now to the far flung parts of the UK . . .

Paul Ives, a Research Assistant at the Department of Computational Science, University of St Andrews, North Haugh, St Andrews KY16 9SX, Scotland, writes to tell me that he is setting up a computer club to serve the interests of the Fife area. The St Andrews Computer Club aims to stimulate general interest in computing, but may specialise in educational applications. Contact Paul for more information.

Richard Baxter, of 167 Muirdykes Avenue, Devon Port, Glasgow, tells me that he is setting up a new club. He is concerned to have a programme of interesting and worthwhile activities, but no detailed arrangements have been made. If you live nearby, why not drop Richard a line?

Also starting new clubs in the celtic fringe are Damien McLennan of 14 Marlborough Street, Londonderry, Northern Ireland, and Alex B Smith, of Cwa Ben, Sachelcourt Avenue, Bishopton, Renfrewshire PA7 5AA, Scotland.

And that's it for this month. Next month I'll try and get some news in from the decadent south.

For information on the ACC contact Rupert Steele, 17 Lawrie Park Crescent, London SE26 6HH, or ring 01-778 6824.

NETWORK NEWS

Peter Tootill gives his monthly summary of what's new in the telephone networking world

The interest in the Bulletin Board scene continues to grow. I have heard of two or three new systems planned, and will give details as soon as they are available.

One difficulty that arises when discussing this hobby is what to call it? 'Communications', 'networks' and the like are all associated with mainframes or tying numbers of micros to a central disk system. 'Telephone networking' is probably the best suggestion I have heard so far. Has anyone any suggestions?

London local board (**TBBS**) has a new number and revised system times. It now joins **Forum-80, Hull,** in providing Bell standards (American modem tones) overnight for callers from North America, and there are quite a few. Details are: Tel: (01) 348 9400; System hours: 9am-1am V21 (European) tones; 1-7am Bell 103 (US) tones.

Mailbox-80, Stourport also has a new number and new system times: Tel: (0384) 635336. Hours: 6pm-8am daily.

Estelle: STC, the electronics components firm, has put a system on line. It is basically for the company's own customers, but apparently it is open to casual customers who may wish to browse. The system is called 'Estelle' and operates on three numbers, each offering a different modem standard. The numbers are as follows, (as yet I have no details of system times):

(0279) 443511 V21 (Datel 200)
(0279) 441188 (Datel 600)
(0279) 441222 (Datel 1200)

New budget priced modem

Dacom, a British company in Milton Keynes, is launching a new originate/answer direct connect modem aimed at the home micro user. It is Telecom approved and retails for around £79.95 (inc VAT). As this is a ready built modem, and not a kit, it looks very good value for money. I have seen a prototype in operation which looked well made (and it worked!). Dacom also sells a range of 'professional' modems, including a low priced (ie, around £285) V21/V23 dual standard modem. Details on (0908) 676797.

Network jargon

The jargon associated with this field is, in many cases, a bit difficult for those not familiar with it. Over the next few months I will be explaining some of the more common terms that you may come across. Let's start off with **Bits and Bauds.** What is the difference between 'baud rate' and 'bits/sec'? If you look 'baud rate' up in a data communications dictionary, it will say something about 'modulation rates' or perhaps 'signalling elements'. The key point to get hold of is that the baud rate refers to how often the signal changes, and takes no account of how much data the signal contains, whereas 'bits/sec' is a measure of how much data is being sent. If each part of the signal contains more than one 'bit' of data, the number of bits per second being transmitted will be greater than the baud rate. The data rate in bits/sec will always be a simple multiple of the baud rate.

Let's take an example. The CCITT V22 standard allows 1200 bits/sec of data to be sent at 600 baud. This is because the data is divided up into pairs of bits, and each part of the signal represents one of these pairs. There are only four possible combinations of the binary digits, (ie, 00, 01, 10, 11) so only four different types of signal are needed to represent all of them. Thus if the rate of change of the signal (called the modulation rate) is 600 times a second (600 baud), you will be sending twice 600, or 1200 bit/sec. The new V22 bit standard divides the signal into groups of four bits, and can transmit 2400 bits/sec at 600 baud! The groups of two and four bits are called 'dibits' and 'quadbits' respectively. I hope that makes everything clear!

Micronet 800

Packages will 'soon' be available for the Spectrum, BBC (Model B) and PET. Also coming soon are TRS-80, RML 380Z, Apple II, Dragon and ZX81. I don't know how soon 'soon' is; I was told in January that the TRS-80 package would be out in February. It hasn't appeared yet, sounds familiar doesn't it? Prices start at £59.74 for the Beeb, and go up to £99.00 plus p&p for certain of the PET. It would be interesting to have some feedback from Micronet users about what they think of it, and how much they end up paying in phone bills.

UK systems run by commercial organisations, which are free at least in part:

DISTEL. Tel: (01) 679 1888. Run by Display Electronics (new and surplus electronic and computer equipt, components, etc). The system provides information about stock lines, credit card sales, and some message facilities. 300 baud only at present. Cost: free. 24 hours.

REWTEL. Tel: (0277) 236628. Run by Radio and Electronics World, the publishing side of Ambit (electronics components suppliers). Information on stock lines, some message facilities, credit card sales, the latter only for subscribers. 300 baud only at present. Cost: limited areas free, remainder £10 annual subscription. 24 hours.

MAPTEL. Tel: (0702) 552941. Run by Maplin (electronic components and microcomputers). Provides information on stock levels, credit card sales to existing customers only. 300 baud only. Cost: free. 24 hours.

Subscriber commercial systems in the UK:

PRESTEL. Subscribers only: Prestel consists of a database made up of individual pages provided by many different organisations (not by Prestel itself). 1200/75 baud service at local call rates for a large percentage of potential users. 300 baud service on London telephone number only, at present. Cost: domestic subscribers £5.00 per quarter and no time charges outside peak periods, 80 per cent of pages are free. Business users: £15 per quarter and 5p/minute up to 6pm and Saturday mornings, no time charges outside these hours (time charges also apply to domestic users). Information: tel: Freefone 2296.

MICRONET 800. An organisation providing information within the Prestel database specifically aimed at microcomputer users. Service details as Prestel. Cost: £50-£75 joining fee (covers acoustic coupler and software — for a limited range of machines at present) and £8 per quarter on top of normal Prestel charges. Information: Micronet 800, 8 Herbal Hill, London EC1R 5JB. Tel: (01) 837 3699.

Subscriber business systems in the UK:

The following are fully fledged commercial systems aimed at business users:

TELECOM GOLD. Info from: Julie Ireland, 42 Weston Street, London SE1 3QD. Tel; (01) 403 6777.

COMET. Message handling system giving user facilities for leaving and retrieving messages: costs £30 per month. Info from: John Douglas, BL Systems Limited, Grosvenor House, Prospect Hill, Redditch, Worcs. Tel: (0527) 28515.

UK networks:

CBBS North East . . . System Operators: Trevor Smith & Malcolm Piper. Tel: (0207) 543555. Hours: 2.30pm-9am daily. Tel: (0207) 32447. Hours: 7pm-midnight CCITT standards; midnight-8.30am Bell 103 (US) standards.

NETWORK NEWS

Mailbox-80, Stourport . . . Tel: (0384) 635336* **System Operator:** Jim Roden. Hours: 6pm-8am daily (ring back system).

Forum-80 Hull . . . (Forum-80 HQ) Tel: (0482) 859169. **System Operator:** Fred Brown. International electronic mail, library for up/down loading software.

Forum-80 Users Group, Pet Users section shopping list system. Hours: Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

Forum-80 London . . . Tel: (01) 902 2546. **System Operator:** Victor Saleh. Electric mail, library for downloading. Hours: Evenings & weekends.

CBBS London . . . Tel: (01) 399 2136. **System Operator:** Peter Goldman. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

Forum-80 Milton . . . (TRS-80 Users Group 80-Nett) Tel: (0908) 613004. **System Operators:** Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system. Hours: 24 hours daily.

Mailbox-80 Liverpool . . . Tel: (051) 428 2733. **System Operator:** Peter Tootill. Electronic mail, downloading, TRS-80 information. Hours: 24 hours daily.

ACC . . . members bulletin board. Tel: (0908) 44262. **System Operator:** Peter Whittle.

TBBS, London . . . Tel: (01) 348 9400* **System Operator:** John Newgas. Hours: Daily 9am-1am V21 (European) tones; 1-7am Bell 103 (US) tones.

Bettisfield Remote CP/M . . . Tel: (094875) 378. **Systems Operator:** Jim Eccleston. Hours: 1-4pm & 7-11pm daily.

American/Canadian networks

TYPE	SYSTEM NAME	NUMBER	NOTES
Forum 80	HQ system	0101.816-861 7040	
CBBS	HQ system	0101.312-545 8086	
FBBS	HQ system	0101.312-677 8514	
ABBS	Ottowa, Ontario	0101.613-725 2243	
ABBS	HQ system	0101.703-255 2192	
MABBS	Fort Walton Beach	0101.904-862 1072	
Bull-80	Alabama	0101.205-492 0373	
Conn-80	Colour Computer	0101.212-441 3755	colour graphics for TRS-80 Colour

European networks

TYPE	SYSTEM NAME	NUMBER	NOTES
ELFA	ABC-MONITOR Sweden	010.468 7300706	Half duplex
ABC-Banken	Halmstadt, Sweden	010.463 5110771	
ABC-MONITOR	ABC Club of Sweden	010.468 801523	Passwords required
CBBS	Gothenburg, Sweden*	010.463 1292160	75/1200 baud
		010.463 1690754	300 baud

* After receiving the tone and connecting your modem, either type: <C/R> or type: <COM C/R>. The system then asks for a password which is: 'cbbs' *in small letters*!! If you only get '>' when you dial up, the system needs resetting and you type <I> C/R.

The above information is correct and current, to the best of my knowledge, but I would be pleased to receive corrections and updates, either via Liverpool Mailbox, or to 7 Stockville Road, Liverpool L18 3EJ.

* Ring back system — dial the number, let phone ring once and then ring back.

COMPUTER TOWN UK! NEWS

Margaret Spooner brings you the latest news on Computer Towns.

Anyone who wants to learn more about computers and is lucky enough to be in or around Nailsea during the first three weeks of November will have an ideal opportunity. In the main Nailsea library there will be a Computer Town UK! exhibition. Computer Towns are autonomous groups in a UK network which aim to spread computer literacy.

The Nailsea exhibition will give people a chance to try out a computer for themselves after an introduction by one of the CTUK! volunteers. Demonstrations and talks will be held to help dispel any fears about computers and to show the public the uses of computers in a variety of areas of general interest such as education, careers and the home.

One of the local schools will hold its computer club meetings in the library during the course of the exhibition to give parents an idea of what their children get up to. And the main Nailsea computer club will also meet at the library.

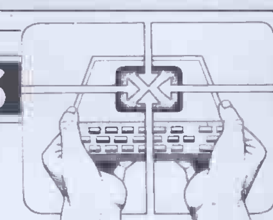
Nailsea is just one of the libraries which will host Computer Towns in the county of Avon in the near future for the Avon county library is organising a series of similar events around the county. Richard Ashby, acting county central lending librarian, is delighted with the enthusiasm shown by local librarians for Computer Town UK! events: 'We have sixty libraries and more than half have shown an interest.' He would also like to hear from volunteers willing to help make Avon county's Computer Towns a success.

The following people have written to us for guidelines with a view to starting Computer Towns:
Mrs E M Aldridge, 17 Elgin Close, Fareham, Hants.
G M Hughes, 45 Court Road, Balsall Heath, Birmingham B12 9LQ.

If you live near them and are interested in joining a Computer Town, do contact them. They're sure to welcome some support.

Computer Town UK! is a rapidly expanding network of computer literacy centres where members of the public are given free access to all sorts of computer equipment. This is courtesy of those willing to offer time/resources. You can find a Computer Town anywhere — they're often in libraries or schools. The aim is to make micros enjoyable and non-threatening, so axe-grinding of any sort is banned. Guidelines are available for those interested in starting up their own' Towns. Write to: Margaret Spooner, Computer Town UK!, PCW, 62 Oxford Street, London W1A 2HG. Remember to enclose an A4 SAE for your reply. Please don't ring PCW for information as Computer Town UK! is entirely a spare time activity.

COMPUTER TOWN UK! CONTACTS



*For further information on Computer Town UK! see Prestel page *800803*

Tony Cartmell
54 Foregate Street
Worcester WR1 1DX

Ted Ellerton
25 Beachdale
Winchmore Hill
London N21

John Stephen Bone
2 Claremont Place
Gateshead
Tyne & Wear NE8 1TL

Andrew Stoneman
135 Birchdale Avenue
Newcastle-Upon-Tyne
Tyne & Wear

Alan Hooley
21 Brammay Drive
Tottington
Bury BL8 3HS

Chris Cooper
110 Church Road
Hanwell
London W7

Paul Maddison
Gardenways
Chilworth Towers
Chilworth
Southampton SO1 7JH

COMPUTER TOWN UK! CONTACTS

Bill Gibbings
2 Longholme Road
Retford
Notts DN22 6TU

Peter J Kiff
2 Ranelagh Grove
St Peter's in Thanet
Broadstairs
Kent CT10 2TE

Derek Knight or Bob Carter
Rayners Lane Library
Imperial Drive
Rayners Lane
Middx

Christopher Bates
Ashford Main Library
Church Road
Ashford
Kent

Brian Taylor
Tonbridge Area Library
Avebury Avenue
Tonbridge
Kent

Mike Perry, Steve Collas or
Dave Lee
The Library
Ealing Road
Wembley
Middx HA0 4BR

Lyn Antill
1 Defoe House
Barbican
London EC2

Peter Jarvis
c/o Health Dept
Corporation of London
Guildhall
London EC2

Vernon Gifford
111 Selhurst Road
Croydon
London SE25 6LH

Peter Stone or
Alan Strangman
Computing and Maths Dept
The Polytechnic
Wulfruna Street
Wolverhampton WV1 1LY

J G Batch
Central Library
Clapham Road
Lowestoft NR32 1DR

John Byfield
Moonrakers
The Rutts
Bushey Heath
Herts WD2 1LH

Robin Bradbeer
Polytechnic of
North London
Holloway Road
London N7

Derek Moody
2 Victoria Terrace
Dorchester
Dorset DT1 1LS

Pam Pollicott
South Ruislip Library
Victoria Road
South Ruislip
Middx

Susan Kelly
Head of Reference Services
PO Box 4
Civic Centre
Harrow
Middx

Derrick Daines
18 Cuttings Avenue
Sutton-in-Ashfield
Notts

Roger Shears
181 Woodmill Lane
Bitterne Park
Southampton SO2 4PY

Ray Skinner
62 Central Avenue
Billingham
Cleveland TS23 1LN

E N Ryan
15 Queens Square
Eastwood
Nottingham NG16 3BJ

Philip Joy
130 Rush Green Road
Romford
Essex

B J Candy
9 Oakwood Drive
Gloucester GL3 3JF

Patrick Colley
52 Queensway
Caversham Park Village
Reading
Berks RG4 0SJ

J M A Kilburn
(Headmaster)
Shawfield Norden
Community Middle School
Shawfield Lane
Norden
Rochdale L12 7QR

Vernon Quaintance
50 Beatrice Avenue
Norbury
London SW16 4UN

Peter Herring
Ordnance Road Library
Ordnance Road
Enfield
Middx

Chris Woodford
31 Hopley Road
Anslow
Burton-on-Trent
Staffordshire

Rex Shipton
17 Woodlands Avenue
Eastcote
Middx

Andrew Holyer
10 Masons Road
Mannings Heath
Horsham
Sussex RH13 6JP

R L Saunders
14 St Nicholas Mount
Hemel Hempstead
Herts

Brigitte Gordon
18 Purbright Crescent
New Addington
Croydon CR0 0RT

Richard Powell
22 Downham Court
South Shields
Tyne & Wear

Peter Earthy
46 High Street
Church Stretton
Shropshire SY6 6BX

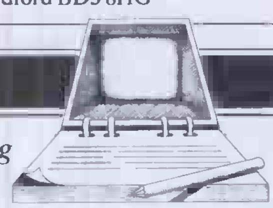
Alan Sutcliffe
4 Binfield Road
Wokingham
Berks RG11 1SL

Alan Porten
14 Foxmede
Rivenhall End
Witham
Essex

David Sharp
5 Bridgenhall Road
Enfield
Middx

Keith Taylor
Carter Hydraulic Works
Thornbury
Bradford BD3 8HG

DIARY DATA



Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

London	(Wembley Conference Centre), Computer Graphics European Conf & Exbn. Contact: Online Conference Ltd, (01) 868 4466	17-20 October
Chiltern	(Challney Community College), Chiltern Computer Fair. Contact: John Pinney, (0582) 5600	22 October
Cardiff	(Park Hotel), Computer Open Day Exbn. Contact: Couchmead Communications, (01) 778 1102	27 October
Birmingham	(NEC), Home Computing Video & Electronics Family Show. Contact: Clapp & Poliak Europe, (01) 747 3131	4-6 November
London	(Regent Crest), Schools Computer Fair. Contact: EPC Publishers Association, (01) 580 6321	9-10 November
Liverpool	(Holiday Inn), Computer Open Day Exbn. Contact: Couchmead, (01) 778 1102	10 November
Glasgow	(Anderson Centre), Scottish Home Computer & Electronics Show. Contact: Ann Lowe, (0764) 4204	11-13 November
Bristol	(Hometech), Personal Computers & Leisure Technology Exbn. Contact: Tomorrow's World Exhibitions Ltd, (0272) 292156/7	11-13 November
London	(Alexandra Pavilion), Int Video & Communications Exbn. Contact: IVAC, (01) 240 1871	13-16 November
London	(Olympia), Compec Exbn. Contact: Reed Exbns, (01) 643 8040	15-18 November

PROGRAMS

PCW is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs to PCW please include the following:-
(a) A cassette or disk of the program
(b) A listing on plain, white paper (typewritten if no printer available).
(c) Comprehensive but brief documentation.
(d) A suitable sae.

Please mark (a), (b) and (c) with your name, address, program title, machine (state minimum RAM where appropriate) and — if possible — a daytime phone number. All programs must, please, be fully debugged. Programs are paid for at the rate of £50 per page of published listing, plus a £100 bonus for the Program of the Month. Send contributions to: Surya, PCW Programs, 62 Oxford Street, London W1A 2HG.

I'll do my best to acknowledge receipt of programs as quickly as possible, but following this acknowledgement it will usually be some time before a decision can be made, so please be patient! Generally speaking, programs which are rejected for any reason are returned fairly quickly, so 'no news . . .'

This month's Programs includes a dedicated database for the Osborne, a text editor for the NewBrain as well as listings for the Atom, BBC, Dragon (author please contact me), Oric and VIC-20.

Next month we are publishing PCW's biggest ever programs section! Machines covered include the BBC, Commodore 64, Dragon 32, NewBrain, Oric, Sharp MZ-80K, Spectrum and ZX81.

Games
Scientific/mathematic
Business
Toolkit/utilities
Educational/Computer Aided Learning

Program of the Month
VIC-20 Robotank

by Bryn Phillips

Just to show a listing doesn't need to be ten metres long to gain the Program of the Month award, Robotank is simple, well-presented and a lovely idea. The program is a Logo-based game for the unexpanded VIC-20.

On running the program, there will be a short delay while the characters are defined. To set the screen, press any key. A battle ground is drawn, containing a number of targets: houses, enemy tanks and guns. The Robotank is situated at the bottom left-hand corner of the screen.

The idea of the game is to program the tank with a series of Logo-style commands in order to destroy as many targets as possible. The available commands are:—
F)orward one length
L)eft 90 degrees
R)ight 90 degrees
S)hoot
P)rogram complete — go

A further command, D)elete last instruction, is offered in case of mistakes. The following simple program, FFFRSLFFSP, would cause the Robotank to move forward three lengths, turn right 90 degrees, shoot, turn left 90 degrees, move two lengths forward then shoot again.

The maximum Robotank program length is 40 commands: if you do not enter P after 40 commands, the tank will start automatically.

If the tank crashes into any obstacle, the game will end; otherwise, you have three runs in which to destroy all targets. The points value of the targets increases with each mission, so careful planning is required to achieve high scores.

My only complaint about the game is that the aim is to destroy things rather than do something constructive. The tank could become a bulldozer with a number of building blocks scattered about the screen. The idea would then be to push the blocks into some predetermined shape.

This said, I think it's a well-conceived program and one which will appeal to all Logo fans. Meantime, if anyone feels like writing that bulldozer game, let me know.

```
10 PRINT"ROBOT TANKPLEASE WAIT"
50 POKE52,28:POKE56,28:CLR
60 FORI=7168TO7679:POKEI,PEEK(I+25600):NEXTI
70 FORC=7384TO7415:READA:POKEC,A:NEXT
80 FORC=7432TO7471:READA:POKEC,A:NEXT
90 POKE36869,255
94 DATA0,0,120,252,255,252,120,0,16,16,56,124,124,124,124,56
95 DATA0,0,30,63,255,63,30,0,56,124,124,124,124,56,16,16
96 DATA0,2,4,72,48,240,232,224,0,0,0,31,24,60,255,255
97 DATA0,0,0,16,60,126,127,255,0,16,57,125,255,147,147,243
98 DATA0,72,130,24,57,4,64,8
100 P1=8164:P2=38884
102 DIMP$(42)
105 PRINT"PRESS ANY KEY"
107 GETA$:IFA$=""THEN107
108 PRINT""
110 FORI=1TO3
111 C=27:X=0:Y=0:SC=0:TM=0:MS=1
115 X=INT(RND(1)*18)+1:Y=INT(RND(1)*18)+1
120 IFPEEK(P1+X-22*Y)<>32THEN115
125 POKEP1+X-22*Y,33:POKEP2+X-22*Y,2
130 NEXTI
135 FORI=1TO5
140 X=INT(RND(1)*18)+1:Y=INT(RND(1)*18)+1
145 IFPEEK(P1+X-22*Y)<>32THEN140
150 POKEP1+X-22*Y,34:POKEP2+X-22*Y,0
155 NEXTI
160 FORI=1TO20
165 X=INT(RND(1)*17)+2:Y=INT(RND(1)*17)+2
170 IFPEEK(P1+X-22*Y)<>32THEN165
175 POKEP1+X-22*Y,35:POKEP2+X-22*Y,5
180 NEXTI
182 FORI=1TO10
184 X=INT(RND(1)*18)+1:Y=INT(RND(1)*18)+1
186 IFPEEK(P1+X-22*Y)<>32THEN184
188 POKEP1+X-22*Y,36:POKEP2+X-22*Y,0
190 NEXTI
195 X=1:Y=1
196 POKEP1+X-22*Y,C:POKEP2+X-22*Y,6
198 X1=X:Y1=Y
200 FORI=1TO41
210 GETA$:IFA$= "F"ORA$= "S"ORA$= "L"ORA$= "R"ORA$= "D"ORA$ ="P"THEN220
215 GOTO210
220 IFA$="P"THEN290
225 POKE36878,10
226 FORM=1TO5:POKE36876,150+VAL(A$):NEXTM
227 POKE36878,0:POKE36876,0
230 IFA$="D"THENI=I-1:PRINT""TAB(I-1)" ":GOTO210
240 P$(I)=A$
250 PRINT""TAB(I-1)P$(I)
260 NEXTI
290 TM=0
300 FORJ=1TOI-1
301 Z=0
305 IFP$(J)="S"THEN510
310 IFP$(J)="L"THENC=C+1:IFC=31THENC=27
320 IFP$(J)="R"THENC=C-1:IFC=26THENC=30
330 IFP$(J)="F"ANDC=27THENX=X+1:IFX>20THENX=20
340 IFP$(J)="F"ANDC=28THENY=Y+1:IFY>18THENY=18
350 IFP$(J)="F"ANDC=29THENX=X-1:IFX<1THENX=1
360 IFP$(J)="F"ANDC=30THENY=Y-1:IFY<1THENY=1
370 POKEP1+X1-22*Y1,32
375 IFPEEK(P1+X-22*Y)<>32THEN2000
380 POKEP1+X-22*Y,C:POKEP2+X-22*Y,6
400 X1=X:Y1=Y
500 GOTO700
510 IFC<>27THEN550
520 FORX2=X+1TOX+5
525 IFX2>20THEN700
530 Y2=Y:GOSUB800
535 IFZ=1THEN700
540 NEXTX2
545 GOTO700
550 IFC<>28THEN600
560 IFC<>28THEN600
570 FORY2=Y+1TOY+5
575 IFY2>18THEN700
580 X2=X:GOSUB800
585 IFZ=1THEN700
590 NEXTY2
595 GOTO700
600 IFC<>29THEN650
610 FORX2=X-1TOX-5STEP-1
615 IFX2<1THEN700
620 Y2=Y:GOSUB800
625 IF Z=1 THEN700
630 NEXTX2
640 GOTO700
650 FORY2=Y-1TOY-5STEP-1
655 IFY2<0THEN700
660 X2=X:GOSUB800
665 IFZ=1THEN700
670 NEXTY2
700 PRINT"SCORE"SC
701 PRINT"HIGH"HG
703 PRINT"MISSION"MS
705 NEXTJ
706 MS=MS+1
707 IFMS>3THENPRINT"GAME OVER":GOTO2020
710 PRINT"                    "
715 PRINT"                    "
720 GOTO200
800 PK=PEEK(P1+X2-22*Y2)
802 IFPK=35THENZ=1:GOTO860
805 POKE36878,15
810 POKEP1+X2-22*Y2,46
820 POKEP2+X2-22*Y2,0
830 FORL=1TO10:POKE36874,220:NEXTL
840 POKEP1+X2-22*Y2,32
850 POKE36878,0:POKE36874,0
855 IFPK<>32THENGOSUB1500
```

```
860 RETURN
1500 POKE36877,220
1501 TM=TM+1
1505 POKEP1+X2-22*Y2,37
1506 POKEP2+X2-22*Y2,2
1510 FORL=15TO0STEP-1
1520 POKE36878,L
1530 FORM=1TO100
1540 NEXTM:NEXTL
1550 POKE36877,0:POKE36878,0
1551 IFPK=33THENSC=SC+25*TM
1552 IFPK=34THENSC=SC+15*TM
1553 IFPK=36THENSC=SC+5*TM
1555 Z=1
1559 POKEP1+X2-22*Y2,32
1560 RETURN
2000 X2=X:Y2=Y:GOSUB1500
2010 PRINT"TANK CRASHED"
2020 PRINT"PRESS Y TO PLAY AGAIN"
2030 GETA$:IFA$<>"Y"THEN2030
2040 IFSC>HGTHENHG=SC
2060 GOTO100
READY.
```

Acorn Scramble

by Nick Foale

'Scramble' is an arcade-style game for a 12k Atom. Having published the program, I should perhaps point out that I'm not overkeen on including assembler programs in *PCW* as they are very difficult to modify and impossible to convert for other machines. I decided, however, to include Scramble since Atom owners do tend to get left out of fast-moving 'action' games.

The program is a version of the arcade game of the same name. You have to shoot down enemy aircraft, bomb rocket bases and destroy fuel dumps. While doing this, you have to avoid enemy aircraft and anti-aircraft guns. You have three runs, each one more difficult than the preceding one.

Being written on the Atom, the graphics are less than awe-inspiring, but they're adequate. One group of 12–14-year-olds gave the program a mean 7/10.

A 12k Atom does not have sufficient room for the source code in the ordinary text area, so spare graphics memory between #8200 and #9800 must be used. To allow access to this section of RAM, enter '?18=#82' followed by NEW before entering the listing.

Having entered the assembler, you are advised to save it before proceeding any further: any errors in the listing could prove fatal! To save the listing, type 'P. & T'. The Atom will respond with a hexadecimal number, XXXX. Now type *SAVE "filename" 8200 XXXX.

Once you have done this, type RUN to assemble the code. Now try to run the program by entering LINK #2908. If anything goes wrong at this point, enter '?18=#82', 'NEW' and 'OLD'. You can now edit the program in the usual way. When everything is working correctly, type 'P. & P+1' to find out where the code ends, the computer again responding with a hex number, XXXX. You can now save the assembled code by entering '*SAVE "filename" 2900 XXXX 2908'. To run the code on future occasions, enter '*LOAD' followed by 'LINK #2908'.

OK, having got all that out of the way, the details are as follows: when prompted to start the game by pressing any key, pressing the space bar switches off the sound effects before starting the game, any other key leaves them on.

The controls are:—

UP/DOWN arrow key	= up
LOCK	= down
[	= left
]	= right
SPACE BAR	= launch missile
RETURN	= drop bomb

Holding down the space bar will release a constant stream of missiles, but each bomb must be dropped by a separate depression of the return key.

Enemy space ships appear as '<', rocket bases as inverse A, rockets as A and fuel dumps as inverse asterisks. A bomb looks like '#', missiles as '-' and land as grey blocks. Your ship looks like ''. Fuel dumps are worth 100 points each, rockets and spaceships five points. The points indicator is at the top left of the screen, with each letter of the alphabet representing 256 points. One point worth noting if you're an experienced 'scrambler' is that it is not important to destroy the fuel dumps in order to gain fuel as in the arcade game, but these still score the highest points.

```
>LIST
    2?£24=£30;?£25=0
    3P.$21;DIMJJ90;F.Z=0TO90;JJZ=-1;N.;F.Z=1TO2;P=£2908;[
    4:JJ80JSR£FD69;LDA@£81;STA£8010;LDA@£8E;STA£8011;LDA@£99
    5STA£8012;STA£8016;LDA@£A0;STA£8013;LDA@£88;STA£8014;LDA@£85
    6STA£8015;JSR£FE94;CMP@32;BNEJJ81;LDA@0;JMPJJ82
    7:JJ81LDA@4;:JJ82STA£A9;JSR£FD69;LDA@10
    8LDA@5;STA£96;STA£97;LDA@0;STA£84;STA£85;STA£86;STA£87;STA£E1
    9STA£98;LDA@3;STA£83;LDA@215;STA£99;LDA@10;STA£8E
   10LDA@64;STA£A6;JSRJJ53;LDY@0;LDA@£66;STA(£A2),Y;LDA@1;STA£A8
   11:JJ78JSRJJ66;LDX@0;LDA0,X;EOR£A9;AND£A9;STA£AA
   12LDA£B002;EOR£AA;STA£B002;LDY@0;:JJ79DEY;BNEJJ79;DEX;BNEJJ78+5
   13DEC£83;LDA£83;BEQJJ74;JSR£FD69;LDA@0;STA£E1;LDA@1;STA£A8
   16LDA@5;STA£96;STA£97;JSRJJ53;LDA@£66;STA(£A2),Y;JMPJJ78
   17:JJ74LDA@0;STA£43;STA£34;LDA£85;STA£25;LDA£84;STA£16
   18JSR£C589;LDX@128;JSR£FB83;JMPJJ80+3
```

PROGRAMS

```
  30:JJ0LDA@£E0;STA£80
  40LDA@£7F;STA£81;LDY@33;JMPJJ2
  50:JJ1LDY@32
  55:JJ2LDA(£80),Y;CMP@£66;BEQJJ3
  60STA£91;LDA@32;STA(£80),Y;LDA£91
  65CMP@£FF,BEQJJ4
  70CMP@32;BEQJJ3
  90CMP@£2D;BEQJJ5
 100CMP@£23;BEQJJ6
 110CMP@£3C;BEQJJ7
 120CMP@£C0;BEQJJ8
 130CMP@£81;BEQJJ9
 135CMP@1;BEQJJ84
 140CMP@£40;BEQJJ10
 150CMP@£AA;BEQJJ11
 160:JJ3INY;CPY@64;BNEJJ2
 170CLC;LDA£80;ADC@32;STA£80
 180LDA£81;ADC@0;STA£81
 190LDA£80;CMP@£E0;BNEJJ1
 200LDA£81;CMP@£81;BNEJJ1
 202DEC£98;BNEJJ52;DEC£99;LDA£99;STA£8C;LDA@30;STA£98
 206:JJ52LDY@0;LDA(£A2),Y;CMP@£66;BEQJJ59
 208LDA@0;STA£A8;RTS
 209:JJ59JMPJJ38
 212:JJ4JMPJJ60
 214:JJ5JMPJJ63
 216:JJ6JMPJJ28
 217:JJ7JMPJJ27
 220:JJ11JMPJJ23
 221:JJ10JMPJJ24
 222:JJ9JMPJJ25
 223:JJ8JMPJJ26
 224:JJ84JMPJJ85
 310:JJ60DEY;CPY@31;BEQJJ3
 315LDA@£FF;STA(£80),Y;INY;JMPJJ3
 400:JJ63INY;CPY@64;BEQJJ46;LDA(£80),Y
 406CMP@£2D;BEQJJ63
 409CMP@32;BNEJJ29
 410LDA@£2D;STA(£80),Y;JMPJJ3
 415:JJ29CMP@£81;BEQJJ32
 420CMP@1;BEQJJ32
 422CMP@£40;BEQJJ32
 425CMP@£3C;BEQJJ32
 430CMP@£AA;BNEJJ31
 435LDA@100;JSRJJ12
 442:JJ31LDA(£80),Y;CMP@£FF;BNEJJ47;DEY
 444:JJ47JMPJJ3
 445:JJ32LDA@5;JSRJJ12
 450:JJ46DEY;JMPJJ31
 500:JJ28CLC;TYA;ADC@32;TAY
 505LDA(£80),Y
 510CMP@32;BNEJJ30
 515LDA@£C0;STA(£80),Y;JMPJJ33
 520:JJ30CMP@£81;BEQJJ34
 525CMP@1;BEQJJ34
 530CMP@£3C;BEQJJ34
 532CMP@£40;BEQJJ34
 535CMP@£AA;BNEJJ33
 540LDA@100;JSRJJ12
 545:JJ33CLC;TYA;SBC@32;TAY;JMPJJ3
 550:JJ34LDA@5;JSRJJ12
 555JMPJJ33
 600:JJ27LDA@32;STA(£80),Y;STY£8A;CPY@32;BEQJJ21
 605DEY;LDA£8D;AND@1;BNEJJ83
 615LDA£8F;AND@32;STA£8B
 620TYA;SEC;SBC£8B;TAY
 635:JJ83LDA(£80),Y;JSRJJ70
 640CMP@£2D;BEQJJ22
 645CMP@£23;BEQJJ22
 650CMP@£C0;BEQJJ22
 652LDA@£3C;STA(£80),Y
 655:JJ21LDY£8A;JMPJJ3
 660:JJ22LDA@5;JSRJJ12;JMPJJ21
 710:JJ26LDA@£23;STA(£80),Y;JMPJJ3
 800:JJ25DEY;CPY@31;BEQJJ16
 807LDA(£80),Y;CMP@32;BEQJJ14
 810CMP@£2D;BEQJJ42
 812JSRJJ70
 815CMP@£23;BEQJJ42
 816CMP@£C0;BEQJJ42
 820:JJ16INY;JMPJJ3
 825:JJ14DEC£A6;BNEJJ15;LDA@64;STA£A6
 826LDA@£40;STA(£80),Y;LDA£AC;ORA@2;STA£AC;JMPJJ16
 840:JJ42LDA@5;JSRJJ12;JMPJJ16
 850:JJ15LDA@£81;STA(£80),Y;JMPJJ16
 900:JJ24CLC;TYA;SBC@32;TAY
 910LDA(£80),Y;CMP@32;BNEJJ43
 915LDA@1;STA(£80),Y;JMPJJ44
 920:JJ43CMP@£2D;BEQJJ45
 922JSRJJ70
 925CMP@£23;BEQJJ45
 930CMP@£C0;BEQJJ45
 935:JJ44CLC;TYA;ADC@32;TAY;JMPJJ3
 940:JJ45LDA@5;JSRJJ12;JMPJJ44
1000:JJ23DEY;CPY@31;BEQJJ18
1005LDA(£80),Y;CMP@32;BNEJJ17
1010LDA@£AA;STA(£80),Y;JMPJJ18
1015:JJ17CMP@£2D;BEQJJ19
1016JSRJJ70
```

```
1017CMP@£C0;BEQJJ19
1020CMP@£23;BEQJJ19
1025:JJ18INY;JMPJJ3
1030:JJ19LDA@100;JSRJJ12
1040JMPJJ18
1100:JJ85LDA@£40;STA(£80),Y;JMPJJ3
1200:JJ12STA£91;LDA@32;STA(£80),Y;LDA£91
1205CLC;ADC£84;STA£84
1210LDA£85;ADC@0;STA£85;STA£8000;INC£8000
1215LDA£AC;ORA@1;STA£AC;RTS
1300:JJ36LDY@0
1305:JJ37LDA@£FF;STA(£80),Y
1310CLC;LDA£80;ADC@32;STA£80
1315LDA£81;ADC@0;STA£81
1320CMP@£82;BNEJJ37;RTS
1400:JJ38LDA@32;LDY@0;STA(£A2),Y;JSR£FE71;TYA
1402CMP@0;BNEJJ13
1403LDA£AC;ORA@4;STA£AC;JMPJJ56
1405:JJ13CMP@13;BNEJJ35
1406LDA£AC;ORA@8;STA£AC;JMPJJ58
1410:JJ35CMP@7;BNEJJ39
1415LDA£96;BEQJJ50;DEC£96;JMP JJ50
1420:JJ39TAX;LDA@1;STA£95;TXA;CMP@5;BNEJJ86
1425LDA£96;CMP@15;BEQJJ50;INC£96;JMPJJ50
1430:JJ86CMP@1;BNEJJ87;LDA£97;CMP@1;BEQJJ50;DEC£97;JMPJJ50
1440:JJ87CMP@3;BNEJJ50;LDA£97;CMP@20;BEQJJ50;INC£97;JMPJJ50
1450:JJ50JSRJJ53;LDY@0;LDA(£A2),Y;CMP@32;BEQJJ64
1460LDA@0;STA£A8
1470:JJ64LDA@£66;LDY@0;STA(£A2),Y;RTS
1500:JJ53LDA@£80;STA£A3;LDA@0;STA£A2;LDX£96;INX
1510:JJ54DEX;BEQJJ55
1515CLC;LDA£A2;ADC@32;STA£A2
1520LDA£A3;ADC@0;STA£A3;JMPJJ54
1525:JJ55CLC;LDA£A2;ADC£97;STA£A2
1530LDA£A3;ADC@0;STA£A3;RTS
1600:JJ56LDY@1;LDA@£2D;STA£94;JMPJJ88
1650:JJ58LDA£95;BEQJJ50;LDA@0;STA£95
1651LDY@32;LDA@£23;STA£94;JMPJJ88
1700:JJ70CMP@£66;BNEJJ69
1710LDA@0;STA£A8
1720:JJ69RTS
1750:JJ88LDA(£A2),Y;CMP@32;BEQJJ57
1752CMP@£81;BEQJJ89
1755CMP@£40;BEQJJ89
1777CMP@1;BEQJJ89
1780CMP@£3C;BEQJJ89
1785CMP@£AA;BEQJJ90
1788JMPJJ50
1790:JJ57LDA£94;STA(£A2),Y;JMPJJ50
1792:JJ89LDA@5;JSRJJ12;LDA@32;STA£94;JMPJJ57
1794:JJ90LDA@100;JSRJJ12;LDA@32;STA£94;JMPJJ57
1800:JJ66CLC;LSR£8D;ROL£8C;LDA£8C;CLC;ADC£8F;STA£8F
1805LDA@0;ADC£8E;STA£8D;LDA£8F;AND@1;CLC;ADC£8E;STA£8E;LDA£8F
1815AND@2;LSRA;STA£8B;LDA£8E;SEC;SBC£8B;CMP@3;BNEJJ41;LDA@4
1817JMPJJ61
1820:JJ41CMP@16;BNEJJ61;LDA@15
1825:JJ61STA£8E;LDA@£80;STA£81;LDA@£1F;STA£80;LDX£8E;INX
1830:JJ62DEX;BEQJJ65
1835CLC;LDA£80;ADC@32;STA£80;LDA£81;ADC@0;STA£81;JMPJJ62
1837:JJ65LDA£80;STA£9E;LDA£81;STA£9F;JSRJJ36;LDA£99;SEC;SBC£8C
1840BCSJJ72;SEC;LDA£9E;SBC@32;STA£9E;LDA£9F;SBC@0
1845STA£9F;LDX@32;SEC;LDA£8F;AND@28;BEQJJ68
1850LDA£8F;AND@140;BEQJJ67
1855LDA£8F;AND@75;BNEJJ71;LDX@£AA
1860:JJ71TXA;LDY@0;STA(£9E),Y;:JJ72JSRJJ0;LDA£A8;BNEJJ73;RTS
1865:JJ67LDX@£81;JMPJJ71
1870:JJ68LDX@£3C;JMPJJ71
1900:JJ73LDA£AC;AND@1;BEQJJ40
1905LDA@0;LDX@150;LDY@16;JMPJJ75
1910:JJ40LDA£AC;AND@2;BEQJJ48
1915LDA@0;LDY@50;LDX@50;JMPJJ75
1920:JJ48LDA£AC;AND@4;BEQJJ49
1925LDA@2;LDX@0;LDY@50;JMPJJ75
1930:JJ49LDA£AC;AND@8;BEQJJ51
1935LDA@0;LDX@25;LDY@100;JMPJJ75
1940:JJ51LDX@20;LDA@0;LDY@125
1945:JJ75STA£AE;STX£AF
1950:JJ76CLC;LDA£AF;ADC£AE;STA£AF;LDA£B002;EOR£A9;STA£B002
1952LDX£AF
1955:JJ77DEX;BNEJJ77;DEY;BNEJJ76;LDA@0;STA£AC;JMPJJ66
2000JN.;P.$6;E.
```

NewBrain Easyprint

by Andrew Pepper

'Easyprint' is a simple text editor. It was written for Epson control codes, but requires very little modification for other printers.

The program is very basic, having a maximum document length of 200 lines, but is perfectly adequate for letters and short documents.

The initial menu lists six options. These are:—

1 Load (text from) tape
2 Enter/edit text
3 Save (current text to) tape
4 Exit program
5 Print (current) text
6 Set print mode value (printer typeface)

PROGRAMS

When editing text, the full NewBrain screen editor applies. Full details can be found in Appendix 3 of the user handbook. In addition to these standard facilities, Easyprint also offers a 'cut and paste' feature. This allows a block of text to be defined, then moved to a new location in the document. Unlike more sophisticated systems, however, only full lines of text may be defined.

To define a piece of text, move the cursor to the first line you wish to define and press CTRL-E. Now use the GRAPHICS and down cursor key to move to the last line to be defined. This deletes the block from the screen and inserts it into a paste buffer. You can now move the cursor to the desired position using the cursor control keys (without the GRAPHICS key, this time). Pressing CTRL-F copies the contents of the paste buffer onto the screen starting at the current cursor position.

To print in italics, press SHIFT ^ before and after the section to be italicised.

To return to the main menu, press the escape key. You will be returned to the menu automatically if you run out of text space. The 'set print mode value' option requests an Epson control code which is then sent to the printer.

```
10 FORi=1TO255:CLOSE#i:NEXTi:OPEN#0,0,"1200":OPEN#4,5
20 OPEN#2,8:PUT23,4:OPEN#1,0,1:PUT#1,23,4
22 ym=0:GOSUB400:PUT6
27 PUT6:IFimTHENPUT17
30 GET#4,a:IFa=0THEN30
31 IFa=27THENGOSUB400:GOTO27
32 IFa=17THENim=TRUE:GOTO27
33 IFa=5THENPUT22,x,y,5:LINPUT("")l$:PUT22,x,y,2:GOTO27
34 IFa=6THENPUT22,x,y,1:PRINTl$:GOTO27
35 PUTa,21:GETx,y:IFy>=199THEN GOSUB400
36 IFy>ymTHENym=y
37 IFa<32THENim=FALSE
40 GOTO27
400 PUT#1,31
410 PRINT#1,"1 - To load tape"
420 PRINT#1,"2 - To enter/edit text"
430 PRINT#1,"3 - To save tape"
440 PRINT#1,"4 - To exit system"
450 PRINT#1,"5 - To print text"
455 PRINT#1,"6 - Set print mode value"
460 PRINT#1:PRINT#1,"Enter Option: ";:LINPUT#1,a$
465 PUT#1,31
470 IFNOTNUM(a$)THEN400
480 IFVAL(a$)<1ORVAL(a$)>6THEN400
490 rt=FALSE:ONVAL(a$)GOSUB500,600,700,800,900,1000
494 IFrtTHENRETURN
495 GOTO400
500 GOSUB750:CLOSE#3:OPEN IN#3,1,f$:PUT31
502 LINPUT#3,a$
505 ym=VAL(a$):FORi=1TOym
510 LINPUT#3,a$:PRINTa$
520 NEXTi
540 RETURN
600 rt=TRUE:RETURN
700 GOSUB750
720 CLOSE#3:OPEN OUT#3,1,f$
725 PRINT#3,ym
730 PUT3:FORi=1TOym:LINPUT("")a$:PRINT#3,a$:NEXTi
740 CLOSE#3:RETURN
750 PRINT#1,"Ready tape, NEWLINE when ready";:LINPUT#1,a$
760 PRINT#1,"Filename = ";:LINPUT#1,f$:RETURN
800 END
900 PUT#2,27,33,mo
905 PUT3:FORi=1TOym
910 LINPUT("")a$
916 IFLEFT$(a$,1)="*"THENta=TRUE
917 IFNOTtaTHEN920
919 PRINT#2:PUT#2,27,108,53-LEN(a$)/2:PRINT#2,CHR$(27);
    "-";CHR$(1);MID$(a$,2):PU
T#2,27,ASC("-"),0,27,108,10:ta=FALSE:GOTO930
920 PRINT#2,a$
930 NEXTi:PUT#2,27,80
960 RETURN
1000 PRINT#1,"Print mode value = ";:INPUT#1,mo
1010 RETURN
```

Osborne Mag Search

by Leslie Fahidy

Osborne 'Mag Search' is a dedicated database program for the Osborne 1. It runs under CP/M.

The program is intended to catalogue magazine articles, with entries stored under the following headings: author, title and/or keywords, issue and page. Of these fields, only the title and/or keywords require any explanation. When entering this field, the title is entered exactly as it

PROGRAMS

appears in the magazine followed by a slash (/) and a brief description or number of keywords. If, for example, you wanted to catalogue Dick Pountain's Benchtest of the Tandy 100, you might enter it as TRS-80 MODEL 100/Benchtest Tandy portable micro. You could then search for any of the keywords following the slash as well as the title itself.

The initial menu contains the following options:—

1 Create a new file
2 Add to existing file
3 Search a file
4 Exit

After selecting option 1, you will be prompted for a filename (up to eight characters with an optional dot and three character extension). This must be a legal filename not already present on the disk since no error checks are made. The current logged drive will be used by default, but a different drive may be specified as part of the filename as in B:PCWFILE. DAT.

The program will then request the author, title/keywords, issue in form yy.mm (eg, 83.08) and starting page. This process will then continue until 'XXXX' is entered for the author to signify all data entered. Mag Search will then close the file and return to the main menu.

Option 2 allows you to update an existing file. This would normally be done on a monthly basis as each new issue is published. The filename will be requested and data input proceeds as for option 1.

Option 3 is the search option. You can search on author, title/keyword or issue. Mag Search will ask you which file it is you wish to search and whether you want a printout. If you answer 'Y' to the latter, all subsequent search results will be echoed to the printer. Again, there are no error checks, so you must enter a capital 'Y' if you want hard copy.

Note that the Osborne does not support a LINE INPUT statement, so commas are illegal and will crash the program. Likewise colons. Use dashes or full stops instead.

The program should be more or less self-explanatory. The author has stated that he is willing to offer help over the phone to readers wanting to convert the program to other dialects of Basic and /or operating systems. His phone number appears at the top of the listing.

Note: The program requires a minimum of 8k.

```
10 REM*********************************************************************
20 REM MAGAZINE SEARCH
30 REM PROGRAMMER:L.L. FAHIDY
40 REM 11 BEAUFORT ROAD,REIGATE SURREY. RH29DQ
50 REM 'PHONE:REIGATE (07372) 44046
60 REM JULY 1983
70 REM*********************************************************************
80 PRINT CHR$(26)
90 PRINT                 M E N U ."
100 PRINT"               ***********":PRINT:PRINT:PRINT
110 PRINT"TO CREATE NEW FILE.......TYPE 1 AND CR."
120 PRINT"TO ADD TO FILE...........TYPE 2 AND CR."
130 PRINT"TO SEARCH FILE...........TYPE 3 AND CR."
140 PRINT"TO EXIT FROM PROGRAM.....TYPE 4 AND CR."
150 PRINT:PRINT:PRINT:INPUT"ENTER YOUR CHOICE...";Q:ON Q GOSUB 170,280,420,1690
160 GOTO 80
170 REM INPUTTING NEW FILE.
180 PRINT CHR$(26):INPUT"NAME OF DATAFILE: ";F$
190 OPEN "O",£1,F$
200 PRINT CHR$(26)
210 INPUT"AUTHOR...IF NO MORE TYPE XXXX ";AUTHOR$
220 IF AUTHOR$="XXXX" THEN 270
230 INPUT"TITLE AND/OR KEYWORDS ";TITLE$
240 INPUT"ISSUE...IN FORMAT: YY.MM ";ISSUE$
250 INPUT"STARTING PAGE ";PAGE$
260 PRINT £1,AUTHOR$;",";TITLE$;",";ISSUE$;",";PAGE$:GOTO 200
270 CLOSE:RETURN
280 REM ADDIN
290 PRINT CHR$(26):INPUT"NAME OF DATAFILE TO EDIT: ";F$
300 OPEN "O",£1,"B:COPY.DAT":OPEN "I",£2,F$
310 IF EOF(2) THEN 340
320 INPUT £2,AUTHOR$,TITLE$,ISSUE$,PAGE$
330 PRINT £1,AUTHOR$;",";TITLE$;",";ISSUE$;",";PAGE$:GOTO 310
340 PRINT CHR$(26)
350 INPUT"AUTHOR...IF NO MORE TYPE XXXX ";AUTHOR$
360 IF AUTHOR$="XXXX" THEN 410
370 INPUT"TITLE AND/OR KEYWORDS ";TITLE$
380 INPUT"ISSUE...IN FORMAT: YY.MM ";ISSUE$
390 INPUT"STARTING PAGE ";PAGE$
400 PRINT £1,AUTHOR$;",";TITLE$;",";ISSUE$;",";PAGE$:GOTO 340
410 CLOSE:KILL F$:NAME "B:COPY.DAT" AS F$:RETURN
420 REM SEARCHING OF DATA.
430 PRINT CHR$(26):INPUT"NAME OF FILE TO SEARCH: ";F$
440 INPUT"PAPER PRINT-OUT? (Y/N) ";PRINTERFLAG$
450 OPEN "I",£1,F$
460 PRINT CHR$(26)
470 PRINT"       S E A R C H  M E N U  ."
480 PRINT"       ************************":PRINT:PRINT:PRINT
490 PRINT"TO SEARCH FOR AUTHOR.....TYPE 1 AND CR."
500 PRINT"TO SEARCH FOR CONTENTS...TYPE 2 AND CR."
510 PRINT"TO SEARCH FOR ISSUE......TYPE 3 AND CR."
520 PRINT"TO RETURN TO MAIN PROG...TYPE 4 AND CR."
530 PRINT:PRINT:PRINT
540 INPUT"YOUR CHOICE...";P:ON P GOSUB 560,770,1490,1680
550 INPUT"PRESS RETURN ";A:RETURN
560 M=0:PRINT CHR$(26)
570 INPUT"NAME OF AUTHOR...";AUTHORSEARCH$
580 IF EOF(1) THEN 750
590 INPUT £1,AUTHOR$,TITLE$,ISSUE$,PAGE$
```

PROGRAMS

```
600 IF (AUTHOR$=AUTHORSEARCH$)OR(INSTR(AUTHOR$,AUTHORSEARCH$)<>0)THEN 620
610 GOTO 580
620 PRINT"AUTHOR:";TAB(15);AUTHOR$
630 IF PRINTERFLAG$="Y" THEN LPRINT"AUTHOR:";TAB(15);AUTHOR$
640 PTITLE$=""
650 FOR C=1 TO LEN(TITLE$)
660 A$=MID$(TITLE$,C,1):IF A$="/" THEN C=LEN(TITLE$):GOTO 680
670 PTITLE$=PTITLE$+A$
680 NEXT C
690 PRINT"TITLE:";TAB(10);PTITLE$
700 IF PRINTERFLAG$="Y" THEN LPRINT"TITLE:";TAB(10);PTITLE$
710 PRINT"ISSUE:";TAB(10);ISSUE$;TAB(20);"PAGE: ";PAGE$
720 IF PRINTERFLAG$="Y"THEN LPRINT"ISSUE:";TAB(10);ISSUE$;TAB(20);"PAGE: ";PAGE$
730 PRINT"**********"
740 IF PRINTERFLAG$="Y" THEN LPRINT"**********"
750 IF M=0 THEN PRINT AUTHORSEARCH$;" NOT FOUND."
760 CLOSE:RETURN
770 M=0:PRINT CHR$(26)
780 INPUT"1, 2, OR 3 KEYWORDS? ";KEY
790 IF (INT(KEY)<>KEY)OR(KEY>3)OR(KEY<1) THEN 780
800 ON KEY GOTO 810,860,990
810 INPUT"ENTER KEYWORD: ";KEY$
820 IF EOF(1) THEN 1450
830 GOSUB 1300
840 IF INSTR(TITLE$,KEY$)<>0 THEN GOSUB 1310 ELSE 820
850 GOTO 820
86  PRINT"ENTER 2 KEYWORDS, SEPARATED BY COMMA. "
870 INPUT KEY1$,KEY2$
880 PRINT"ENTER CONNECTIVE (AND/OR) BETWEEN THEM. ":INPUT CONNECT$
890 IF EOF(1) THEN 1450
900 GOSUB 1300
910 IF CONNECT$="OR" THEN 960
920 IF CONNECTS<>"AND" THEN 880
930 IF INSTR(TITLE$,KEY1$)<>0 THEN MARK=1
940 IF (MARK=1)AND(INSTR(TITLE$,KEY2$)<>0)THEN MARK=0:M=M+1:GOSUB 1310
950 GOTO 890
960 IF INSTR(TITLE$,KEY1$)<>0 THEN MARK=1
970 IF(MARK=1)OR(INSTR(TITLE$,KEY2$)<> 0) THEN MARK=0:M=M+1:GOSUB 1310
980 GOTO 890
990 PRINT"ENTER 3 KEYWORDS, SEPARATED BY COMMAS. "
1000 INPUT KEY1$,KEY2$,KEY3$
1010 PRINT"CONNECTIVE (AND/OR) BETWEEN FIRST 2: ":INPUT CONNECT1$
1020 PRINT"CONNECTIVE (AND/OR) BETWEEN SECOND 2: ":INPUT CONNECT2$
1030 IF EOF(1) THEN 1450
1040 GOSUB 1300
1050 IF(CONNECT1$="OR")AND(CONNECT2$="OR")THEN 1100
1060 IF(CONNECT1$="OR")AND(CONNECT2$="AND")THEN 1150
1070 IF(CONNECT1$="AND")AND(CONNECT2$="OR")THEN 1200
1080 IF(CONNECT1$="AND")AND(CONNECT2$="AND")THEN 1250
1090 GOTO 1010
1100 IF INSTR(TITLE$,KEY1$)<>0 THEN M1=1
1110 IF INSTR(TITLE$,KEY2$)<>0 THEN M2=1
1120 IF INSTR(TITLE$,KEY3$)<>0 THEN M3=1
1130 IF(M1=1)OR(M2=1)OR(M3=1)THEN M1=0:M2=0:M3=0:M=M+1:GOSUB 1310
1140 GOTO 1030
1150 IF INSTR(TITLE$,KEY1$)<>0 THEN M1=1
1160 IF INSTR(TITLE$,KEY2$)<>0 THEN M2=1
1170. IF INSTR(TITLE$,KEY3$)<>0 THEN M3=1
1180 IF(M1=1)OR(M2=1)AND(M3=1)THEN M1=0:M2=0:M3=0:M=M+1:GOSUB 1310
1190 GOTO 1030
1200 IF INSTR(TITLE$,KEY1$)<>0 THEN M1=1
1210 IF INSTR(TITLE$,KEY2$)<>0 THEN M2=1
1220 IF INSTR(TITLE$,KEY3$)<>0 THEN M3=1
1230 IF (M1=1) AND (M2=1) OR (M3=1) THEN M1=0:M2=0:M3=0:M=M+1:GOSUB 1310
1240 GOTO 1030
1250 IF INSTR(TITLE$,KEY1$)<>0 THEN M1=1
1260 IF INSTR(TITLE$,KEY2$)<>0 THEN M2=1
1270 IF INSTR(TITLE$,KEY3$)<>0 THEN M3=1
1280 IF(M1=1)AND(M2=1)AND(M3=1)THEN M1=0:M2=0:M3=0:M=M+1:GOSUB 1310
1290 GOTO 1030
1300 INPUT £1,AUTHOR$,TITLE$,ISSUE$,PAGE$:RETURN
1310 M=M+1:PRINT"AUTHOR:";TAB(15);AUTHOR$
1320 IF PRINTERFLAG$="Y" THEN LPRINT"AUTHOR:";TAB(15);AUTHOR$
1330 PTITLE$=""
1340 FOR C=1 TO LEN(TITLE$)
1350 A$=MID$(TITLE$,C,1):IF A$="/" THEN C=LEN(TITLE$):GOTO 1370
1360 PTITLE$=PTITLE$+A$
1370 NEXT C
1380 PRINT"TITLE:";TAB(10);PTITLE$
1390 IF PRINTERFLAG$="Y" THEN LPRINT"TITLE:";TAB(10);PTITLE$
1400 PRINT"ISSUE:";TAB(10);ISSUE$;TAB(20);"PAGE: ";PAGE$
1410 IF PRINTERFLAG$="Y"THEN LPRINT"ISSUE:";TAB(10);ISSUE$;TAB(20);"PAGE ";PAGE$
1420 PRINT"**********"
1430 IF PRINTERFLAG$="Y" THEN LPRINT"**********"
1440 RETURN
1450 IF M=0 THEN PRINT"KEYWORD(S) NOT FOUND."
1460 CLOSE:RETURN
1470 IF M=0 THEN PRINT TITLESEARCH$;" NOT FOUND. "
1480 CLOSE:RETURN
1490 M=0:PRINT CHR$(26)
1500 INPUT"ISSUE...IN FORMAT: YY.MM ";ISSUESEARCH$
1510 IF EOF(1) THEN 1680
1520 INPUT £1,AUTHOR$,TITLE$,ISSUE$,PAGE$
1530 IF ISSUESEARCH$<>ISSUE$ THEN 1510
1540 PRINT"AUTHOR:";TAB(15);AUTHOR$
1550 IF PRINTERFLAG$="Y"THEN LPRINT"AUTHOR:";TAB(15);AUTHOR$
1560 PTITLE$=""
1570 FOR C= 1 TO LEN(TITLE$)
1580 A$=MID$(TITLE$,C,1):IF A$="/" THEN C=LEN(TITLE$):GOTO 1600
1590 PTITLE$=PTITLE$+A$
```

PROGRAMS

```
1600 NEXT C
1610 PRINT"TITLE;";TAB(10);PTITLE$
1620 IF PRINTERFLAG$="Y"THEN LPRINT"TITLE:";TAB(10);PTITLE$
1630 PRINT"ISSUE:";TAB(10);ISSUE$;TAB(20);"PAGE: ";PAGE$
1640 IF PRINTERFLAG$="Y"THEN LPRINT"ISSUE:";TAB(10);ISSUE$;TAB(20);"PAGE:";PAGE$
1650 PRINT"**********"
1660 IF PRINTERFLAG$="Y" THEN LPRINT"**********"
1670 GOTO 1510
1680 CLOSE:RETURN
1690 END
```

Atom Decision Maker

by Ben Rubenstein

There are a number of programs floating around describing themselves as 'decision-makers', the majority of which are no more than user-friendly random number generators. 'Atom Decision Maker' is not one of these, you'll be glad to hear.

The program is designed to help you put a number of items into order of preference. It does this by presenting successive pairs of items and asking you to indicate your preference by typing 'A' for item a, 'B' for item b or '=' for no preference.

Having ascertained that you prefer *PCW* to *Weekly Computer Rag* and *WCR* to *Impractical Computing*, for example, it will assume that you prefer *PCW* to *IC*. This saves a lot of time as it greatly reduces the number of decisions you have to make.

In the listing below, data has been entered in lines 50-68 with line 70 indicating end of data. Data may be entered anywhere in the program provided that no attempt is made to execute it, but must be preceded by an inverted '[' as in the listing. The author does point out, however, that placing data at the beginning of the program and having the program jump over it does speed things up.

Incidentally, the routine to locate and 'read' data (lines 200-250) is a very neat way of compensating for the lack of READ and DATA statements on the Atom and could be usefully incorporated into other programs. It works by shooting through the program in search of inverse '['s. When it finds them, it sets B to the address of the first data string less 1, sets N to the number of data strings and dimensions the array AA for N elements. Line 240 then fills the array with the addresses of the data strings.

Although of debatable use for most practical decisions, one area in which Decision Maker does come into its own would be, for example, a competition requiring a list of features to be put into order of importance. 'The most important features of the MANKI computer are . . .
1 It will be manufactured not later than two years after launch.
2 It lets you use at least 50% of stated RAM.
3 No more than 12 totally incompatible versions of the operating system will be released.'
That sort of thing.

```
>LIST
   1G.a
  50{PRESTATS
  52{ELENA
  54{LEONIDAS
  56{ACKERMANNS
  58{ALTMANN & KUHNE
  60{ROCOCO
  62{LESSITERS
  64{GODIVA
  66{NEUHAUS
  68{TEUSCHER
  70{
 100a
 110 GOS.d;@=2;T=£100;L=£B002;U=£3B00
 115 F.A=0TO(N*N);A?U=0;N.A;F.A=0TO(N*N)S.(N+1);A?U=4;N.A
 120 DO
 130bDO S=A.R.%N;R=A.R.%N;?L=?L:4;U.S<>R
 132 P=S*N+R; IF P?U>0;G.b
 134 Q=R*N+S; IF Q?U>0;G.b
 140 P.$12''"A:"'$AA(S)''"B:"'$AA(R)''''
 145 GOS.i
 150 P?U=B;Q?U=A
 155 GOS.j
 160 W=0;F.A=0TO O;C=A*N+U;F.D=0TO O; W=W+(C?D=0);N.D;N.A
 170 U.W=0
 180 GOS.p
 199E.
 200d
 210 A=£2900;N=-1;P."SEARCHING"
 220 DODOA=A+1;U.?A=CH"{";P."."
 225 N=N+1;IFN=0;B=A
 230 U.A?1=13;DIMAA(N);P."....";O=N-1
 240 A=B-1;F.S=0TO N;DOA=A+1;U.?A=CH"{";P.".";AA(S)=A+1;N.S
 250R.
 300j
 310 F.A=0TO(N-1);IFA=R;G.k
 320 C=S*N+A;IFC?U<>Q?U;G.k
 330 J=A*N+R;IFJ?U>0;G.k
 340 J?U=P?U;K=R*N+A;K?U=Q?U
```

```
350kN.A;R.
400i
410 DOP.$11;LINK £FE22;IN."PREFER A OR B "$T
415 U.(?T=65)¦(?T=66)¦(?T=61)
420 A=(?T-65)*2+1;IF?T=61;A=2
430 B=4-A;R.
500p
510 P.$12;?£E1=0
520 F.A=OTO O;W=0;B=A*N+U;F.C=0 TO O;W=W+B?C;N.C;?B=W;N.A
530 F.A=1TON;W=0;M=0;F.B=OTO O;C=B*N+U
535 IFM<?C;IFC?1>0;M=?C;D=C+1;W=B
540 N.B;?D=0;@=0;M=M-4-O;L=5*(M%2);M=M/2
545 @=2;P.A,": "$AA(W);@=0;?224=25;P."("M"."L")"'
550 N.A;?£E1=128;R.
```

BBC Clock

by Patrick McAndrew

'Clock' is an interrupt-driven assembler program for a BBC A or B using the 1.2 OS. It will not run under other operating systems.

It provides a real time clock which is constantly updated and displayed while your machine runs other programs. The program places the top line of the display out of bounds to Basic programs, and uses this to display a digital 24-hour clock with hours, minutes and seconds. Since the top line is reserved, the clock is unaffected by CLS statements. Following changes in mode, the clock will reappear on return to mode 7.

The clock remains accurate with Basic programs running: I left it running for an afternoon while I played a few games of 'Missile Defender', tried out a variable change program and had a go at a game called 'Hexplode' (all of which, incidentally, will appear in these pages at a future date). The clock was totally unimpressed with all this activity and lost only 40 seconds in just under six hours.

It's worth noting that hitting the break key will thoroughly confuse Clock, but this is unavoidable given the way in which the break function is carried out on the BBC machine.

Incidentally, if you find that the top line of the display is only half visible, it is possible to adjust the display by entering *TV255,1 and then MODE7.

```
   10 REM Clock by P.McAndrew June 1983
   20 CODE%=&D01
   30 M0=&DC0
   40 M1=&DC1
   50 M2=&DC2
   60 M3=&DC3
   70 oswrch=&FFEE
   80 osbyte=&FFF4
   90 FORI%=0TO2STEP2
  100   P%=CODE%
  110   [OPTI%
  120   .start
  130   PHP          \ Save registers
  140   PHA
  150   TXA
  160   PHA
  170   TYA
  180   PHA
  190   INC M0       \ M0=50ths of
  200   LDA M0       \      seconds
  210   CMP#50
  220   BMI exit1    \ 2step exit avoids
  230   LDA#0        \ out of range
  240   STA M0
  250   SED
  260   LDA M1       \ M1=seconds
  270   CLC
  280   ADC#1
  290   STA M1
  300   CMP#&60
  310   BMI nocarry
  320   LDA#0
  330   STA M1
  340   LDA M2       \ M2=minutes
  350   CLC
  360   ADC#1
```

PROGRAMS

```
 370   STA M2
 380   CMP#&60
 390   BMI nocarry
 400   LDA#0
 410   STA M2
 420   LDA M3        \ M3=hours
 430   CLC
 440   ADC#1
 450   CMP#&24
 460   BMI ok
 470   LDA#0
 480   .ok
 490   STA M3
 500   .nocarry
 510   CLD
 520   LDA#135       \ IF MODE 7 display
 530   JSR osbyte    \ ELSE exit
 540   CPY#7
 550   .exit1
 560   BNE exit
 570   LDY#0
 580   LDA#28        \ Reserve top line
 590   JSR oswrch
 600   LDA#0
 610   JSR oswrch
 620   LDA#24
 630   JSR oswrch
 640   LDA#39
 650   JSR oswrch
 660   LDA#1
 670   JSR oswrch
 680   LDA M3        \ write hours
 690   JSR wrttbyte
 700   LDA M3
 710   JSR wrtbbyte
 720   LDA#ASC"-"    \     -
 730   STA &7C20,Y
 740   INY
 750   LDA M2        \    minutes
 760   JSR wrttbyte
 770   LDA M2
 780   JSR wrtbbyte
 790   LDA#ASC"-"    \     -
 800   STA &7C20,Y
 810   INY
 820   LDA M1        \    seconds
 830   JSR wrttbyte
 840   LDA M1
 850   JSR wrtbbyte
 860   .exit
 870   PLA           \ Restore registers
 880   TAY
 890   PLA
 900   TAX
 910   PLA
 920   PLP           \ and return to
 930   RTS           \ normal routine
 940   .wrttbyte
 950   LSRA          \ write MSB
 960   LSRA
 970   LSRA
 980   LSRA
 990   CLC
1000   .wrt
1010   ADC#ASC"0"
1020   STA &7C20,Y
1030   INY
1040   RTS
```

```
1050   .wrtbbyte
1060   AND#&0F       \ write LSB
1070   JMP wrt
1080   ]
1090   NEXT
1100 ?&220=CODE%AND255
1110 ?&221=CODE%DIV256
1120 P%=&DD0
1130 [OPT2
1140 LDA#1           \ BREAK set up
1150 STA&220
1160 LDA#&D          \ as EVNTV = D01
1170 STA&221
1180 LDA#14          \ *FX14 4
1190 LDX#4
1200 JSRosbyte
1210 RTS
1220 ]
1230 REM ON BREAK JMP &DD0
1240 *FX247 76
1250 *FX248 208
1260 *FX249 13
1270 MODE7
1280 INPUTTAB(0,5)"Time h,m,s ",h,m,s
1290 ?M0=0
1300 ?M1=EVAL("&"+STR$s)
1310 ?M2=EVAL("&"+STR$m)
1320 ?M3=EVAL("&"+STR$h)
1330 *FX14 4
1340 REM *FX13 4 stops clock
1350 REM *FX14 4 restarts clock
1360 REM to set time
1370 REM ?&DC0=0   : ?&DC1=&ss
1380 REM ?&DC2=&mm: ?&DC3=&hh
1390 END
```

Dragon World

by Mike Norris

'World' was written on a Dragon 32 and should also run on the Tandy Colour Computer, though I must stress that as we don't have a test machine available I make no guarantees. The program produces a rotating globe like the one on the Beeb (the Broadcasting Corporation, not the micro).

When run, the program gives garbage on the screen for about twenty five seconds. This is caused by the POKE that speeds up the interpreter in line 1. If you change this POKE to 65495,0 you will be able to watch the program being set up. If you do this, change the POKE in line 23 to 65494,0. Incidentally, the POKE in line 1 can be used in any program but I have heard that some Dragons don't like being hurried in this way and will crash without warning as a means of retaliation. This won't do any harm provided that you have got the program safely on tape, so try it and see.

Lines 1-23 set up the maps on the screen using the arrays A to I; line 26 is the loop to do the painting and 27 onwards contains the strings for maps and data for printing.

The strings M$ through P$ are the blank moves to the first drawing coordinates; the other strings contain the drawing data for the continents of India, Australia, America, Africa, Arctic and Europe. These are redefined to give slightly different coastlines as the globe rotates.

The author would be interested to hear from anyone who works out a more efficient method of achieving the same effect. Readers can contact him c/o Surya at the usual *PCW* address.

One final word of warning: keying in errors is quite likely to cause the program to be lost irretrievably, so CSAVE it before running.

```
0 '*** ROTATING GLOBE BY MIKE NORRIS JANUARY 1983 ***
1 CLEAR50:PCLEAR4:PMODE3:SCREEN1,0:COLOR2,3:PCLS:POKE65497,0
2 DIMA(15,15),B(15,15),C(15,15),D(15,15),E(15,15),F(15,15),G(15,15),H(15,15),I(1
5,15):X=100:Y=100:R=48:R1=76:X1=52:Y1=50:X2=152:Y2=150:C1=1:C2=2:C3=3:C4=4
3 GOSUB27:GOSUB25:M$="BM54,92":N$="BM68,96":O$="BM144,112":P$="BM82,58"
4 Q$="XM$;XIN$;XN$;XAU$;XO$;XAM$;XP$;XAR$;":DRAW Q$:I1=5:GOSUB26
5 GET(X1,Y1)-(X2,Y2),A,G
6 PCLS:GOSUB25:GOSUB31:M$="BM73,92":N$="BM84,100":O$="BM130,68":P$="BM94,54"
7 Q$="XM$;XIN$;XN$;XAU$;XM$;XAF$;XO$;XAM$;XP$;XAR$;":DRAW Q$:I1=4:GOSUB26
8 GET(X1,Y1)-(X2,Y2),B,G:PCLS:GOSUB25:GOSUB32:M$="BM92,88":N$="BM102,94"
9 Q$="XM$;XIN$;XN$;XAU$;XM$;XAF$;":DRAW Q$:I1=2:GOSUB26:GET(X1,Y1)-(X2,Y2),C,G
10 PCLS:GOSUB25:GOSUB33:M$="BM104,86":N$="BM122,94":O$="BM90,144":P$="BM76,64"
11 Q$="XM$;XIN$;XN$;XAU$;XP$;XAF$;XO$;XAR$;":DRAW Q$:I1=3:GOSUB26
12 GET(X1;Y1)-(X2,Y2),D,G:PCLS:GOSUB25:GOSUB34:M$="BM90,68"
```

PROGRAMS

```
13 Q$="XM$;XAF$;XM$;XEU$;":DRAW Q$:I1=4:GOSUB26:GET(X1,Y1)-(X2,Y2),E,G
14 PCLS:GOSUB25:GOSUB35:M$="BM114,64":N$="BM64,94":O$="BM88,56"
15 Q$="XM$;XAF$;XN$;XAM$;XO$;XAR$;":DRAW Q$:I1=5:GOSUB26
16 GET(X1,Y1)-(X2,Y2),F,G:PCLS:GOSUB25:GOSUB37:M$="BM130,66":N$="BM72,96"
17 Q$="XM$;XAF$;XN$;XAM$;XM$;XEU$;":DRAW Q$:I1=6:GOSUB26
18 GET(X1,Y1)-(X2,Y2),G,G:PCLS:GOSUB25:GOSUB38:M$="BM96,98":N$="BM66,128"
19 Q$="XM$;XAM$;XN$;XEU$;":DRAW Q$:I1=4:GOSUB26:GET(X1,Y1)-(X2,Y2),H,G
20 PCLS:GOSUB25:GOSUB39:M$="BM122,94":N$="BM46,96":O$="BM38,88":P$="BM88,144"
21 Q$="XM$;XAM$;XN$;XAU$;XO$;XIN$;XP$;XAR$;":DRAW Q$:I1=5:GOSUB26
22 GET(X1,Y1)-(X2,Y2),I,G:COLORC1,C4:PCLS:X1=76:X2=176
23 X=X+26:R=70:GOSUB25:PAINT(X,Y),C2:PUT(X1,Y1)-(X2,Y2),I,PSET:POKE65496,0
24 PUT(X1,Y1)-(X2,Y2),A,PSET:PUT(X1,Y1)-(X2,Y2),B,PSET:PUT(X1,Y1)-(X2,Y2),C,PSET
:PUT(X1,Y1)-(X2,Y2),D,PSET:PUT(X1,Y1)-(X2,Y2),E,PSET:PUT(X1,Y1)-(X2,Y2),F,PSET:P
UT(X1,Y1)-(X2,Y2),G,PSET:PUT(X1,Y1)-(X2,Y2),H,PSET:PUT(X1,Y1)-(X2,Y2),I,PSET:GOT
O24
25 CIRCLE(X,Y),R,C2:RETURN
26 FORI=1TOI1:READJ,K:PAINT(J,K),C1,C2:NEXTI:CIRCLE(X,Y),R1,C2:PAINT(148,112),C2
,C2:PAINT(66,64),C2,C2:RETURN
27 IN$="C2R4F2R2D2U2E6F6D2U6E6R2E6U8R2F4U2H2U4E4R6F2D2R2U6R2;BM-10,+14;D4G4;BM-1
0,+6;D2;BM-20,+8;R2"
28 AU$="F2D2R2;BM+4,+0;F2R2U2E2L2G2;BM+8,+2;D2R8D2L2;BM-2,+6;U2R2F6D2G4D4L2H4L8G
2H2U4H2E4R6F4E2U2;BM+0,+20;R2;BM+8,+0;R2G2L2;BM+6,-6;R2E2L2U2"
29 AM$="H2U2H4U6R2E2U2H2L2H4U8H4D2H2U4H6L2G4E4U4E2;BM+20,+22;L6D4F2R2F2;BM-28,+5
4;L12H2L18G2L2"
30 AR$="R8H2R6F2E2R6D4G2H2":RETURN
31 AR$="R4F2R8E2R2F2R2F2G2":AF$="H8L4D2F4D2G2L2H4BM-2,+6R4D2G4D2":AM$="G2D4G2E2R
6D2F8R2BM-30,+60L14H2L10G2":RETURN
32 AF$="L4H2L2H2L2G2F4G2L2H4G2F6R2G2L2G4D2G4D12G2D4G4H8U6H2BM+0,-26R8E2R4E2U6R4U
2L2G2L6H2G2BM+16,+40D2L2D4L2BM+8,+20E2F4BM+18,+2R2E2R6E2R6E2R6":RETURN
33 AF$="D2L4D2G2D2G2L2G2D2F2E4R8D2U2R2F2R4E2R2D2L2D8L2G2L2G2L4H2U4L6G2L2G2D2L2D2
F4R4F8D6F2D6F2D6R6E4U14E2U2E8L2H2L2H4U2R4F4E2H2U2R6F2R2BM-19,+32D2L2D2L2":AR$="R
8D2R6":RETURN
34 EU$="E2R2E2R2E2U4H2G2D2U2L2U2E2BM-8,+6G2F2G2H2BM-30,+34R4F4R2D6G2D6G4BM+26,+2
4U2R18F2D2BM+18,-54F6E2U2E4F2R2F2R4"
35 AM$="F2G6D6F6R2F2D12F2D2F4E2H2U10E4U6E2U2E2R2U4H2L2H2L2H6L6H6L2H2U2E2R6F2U4E2
U2E8H2E2R4H4L2G2L6H2U2E2L4H2L6G2H2L2G2H2D2G2L2G2F2D2G4L4R6F2D6F2D2F2H2E2F6D2F2D2
F2R4F4BM+6,-6"
36 AR$="D2F2R2E2U4BM+4,+6R2BM+4,+4E2D4R2BM+2,+2R2E2R2E2U4H2G4H2E6BM-34,+92U2H2G2
":RETURN
37 EU$="R2E2BM-6,+0G2U4G2BM-6,-4R2BM-12,-4D2G2L2U2H4BM+0,+94H4U4L2G6BM+44,-2E2U2
E2R4":RETURN
38 EU$="E2BM+34,+24R2E2R4E2R2F2R8BM+20,-30H2U6H4U6H2L6U10E4R6BM-2,-4L4H2U4E4":RE
TURN
39 AR$="R4E2R2F2R6F2R2D4":RETURN
40 DATA68,78,130,68,144,106,92,122,96,144,68,80,100,122,96,144,132,70,100,70,114
,114,120,70,138,112,74,100,112,80,56,102,98,146,92,104,136,72,64,72,64,110,90,58
,120,100,132,106,82,112,66,76,136,72,92,144,104,56,94,72,100,102,140,96,136
41 DATA74,120,66,136,102,66,116,66,70,94,144,***CHECKSUM = 7526 ***
```

BBC/Tandy CGP-115 Screendump

by John Webb

Another screendump program, this time for the Tandy Colour Graphics Printer. The program utilises a 'grey scale' to represent colour. Screendumps may not be the most exciting of programs, but they do come in useful.

Output is slow, taking around 6-7 minutes per colour. BBC owners with the 0.1 OS will need to change line 20120 to read VDU26 and line 20310 to read VDU28,0,0,0,0. This slows things down even further, so if you are cursed with Acorn's first attempt I suggest you find a nice, long Benchtest to read while you're waiting.

To use the screendump, merge the listing below and call it by PROCscreendump.

```
20000 DEFPROCscreendump
20010 REM To use this sreen dump then ap
pend these procedures to your program an
d call PROCscreendump when you want the
screen printed.
20020 REM This program will print the sc
reen in three colours - the background c
olour will not be printed.
20030 PROCprinterzero
20040 FORC%=1TO3
20050   F%=1:PRINT"H":PRINT"C";C%
20060   FORB%=1024TO0STEP-4
20070     Y%=B%*.375-384
20080     IFF%=1THENPROCforward ELSEPROC
back
20090     NEXT
20100   NEXT
20110 PRINT"M0,";Y%
20120 *FX3,0
20130 VDU3
20140 ENDPROC
20150 DEFPROCforward
```

```
20160 IFPOINT(2,B%)=C%THENPRINT"M0,";Y%
20170 A%=2:REPEAT
20180   IFPOINT(A%,B%)=C%REPEAT:A%=A%+4:
UNTILPOINT(A%,B%)<>C%ORA%>1280:A%=A%-4:X
%=A%*.375+.5:PRINT"D";X%;",";Y%
20190   REPEAT:A%=A%+4:UNTILPOINT(A%,B%)
=C%ORA%>1280:IFA%>1280THEN20200ELSEA%=A%
-4:X%=A%*.375+.5:PRINT"M";X%;",";Y%
20200   A%=A%+4:UNTILA%>1280
20210 F%=2:ENDPROC
20220 DEFPROCback
20230 IFPOINT(1278,B%)=C%THENPRINT"M480,
";Y%
20240 A%=1278:REPEAT
20250   IFPOINT(A%,B%)=C%REPEAT:A%=A%-4:
UNTILPOINT(A%,B%)<>C%ORA%<0:X%=A%*.375+.
5:PRINT"D";X%;",";Y%:A%=A%+4
20260   REPEAT:A%=A%-4:UNTILPOINT(A%,B%)
=C%ORA%<0:IFA%<0THEN20270ELSEX%=A%*.375+
.5:PRINT"M";X%;",";Y%:A%=A%+4
20270   A%=A%-4:UNTILA%<0
20280 F%=1:ENDPROC
20290 DEFPROCprinterzero
20300 VDU2,26,1,18,1,65,1,13,1,18,4
20310 *FX3,10
20320 ENDPROC
```

BBC Envelope Designer

by Peter Wooton

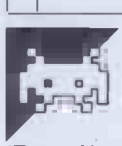
The BBC micro has a very powerful sound facility controlled by the ENVELOPE statement. Due to its complexity, it can often take a lot of trial-and-error to achieve the desired effect. 'Envelope Designer' allows you to experiment with different settings of both SOUND and ENVELOPE and hear the results.

The program displays the current parameters and allows you to change any or all of them by selecting the appropriate menu option. Selecting option 15 (Sound) allows you to change the SOUND if desired before playing the sound you have created. Once you have a sound you like, you can printout all the parameters by selecting option 16. If you have a printer, you could change 560 and 570 to LPRINT instead of PRINT to obtain a hard copy.

Option 17 displays a diagram of either pitch or amplitude.

```
   10REM ENVELOPE DESIGNER
   20REM         BY
   30REM PETER WOTTON
   40ONERRORGOTO990
   50MODE6
   60N=0:S=0:P1=0:P2=0:P3=0:N1=0:N2=0:N3=0:AA=0:AD=0:AS=0:AR=0:TA
=0:TD=0:WE=0:DR=9:CH=0:W=0:Q=0
   70CLS
   80PRINTTAB(0,1);"1)NO.(1/4)=";N,"2)STEP(1/127)=";S,"3)P.1(-128
/127)=";P1,"4)P2(-128/127)=";P2,"5)P3(-128/127)=";P3,"6)N.1(0/255
)=";N1,"7)N.2(0/255)=";N2,"8)N.3(0/255)=";N3
   90PRINT"9)AA(-127/127)=";AA,"10)AD(-127/127)=";AD,"11)AS(-127/
0)=";AS,"12)AR(-127/0)=";AR,"13)TARG.A(0/126)=";TA,"14)TARG.D(0/1
26)=";TD,"15)SOUND?   ","16)PRINTOUT","17)DIAGRAM"
  100PRINT''"WHICH NO. DO YOU WANT ";
  110INPUTSD
  120PRINT'
  130IFSD>17THEN110ELSEIFSD=0THENSD=WE+1
  140WE=SD:IFWE>17THENWE=1
  150ON WE GOTO 280,300,320,340,360,380,400,420,440,460,480,500,5
20,540,170,560,600
  160GOTO70
  170ENVELOPEN,S,P1,P2,P3,N1,N2,N3,AA,AD,AS,AR,TA,TD
  180IFDR=9THEN210
  190PRINT"DO YOU WANT TO CHANGE SOUND?(' '(N)OR KEY(Y))"
  200IFGET$=" "THEN260
  210PRINT'"WHICH CHANNEL"
  220INPUTCH
```

```
230DR=4
240PRINT'"PITCH?":INPUTW
250PRINT"DURATION?":INPUTQ
260SOUNDCH,N,W,Q
270GOTO70
280PRINT"CHANGING N":INPUTN
290GOTO160
300PRINT'"CHANGING S":INPUTS
310GOTO160
320PRINT'"CHANGING P.1":INPUTP1
330GOTO160
340PRINT'"CHANGING P.2":INPUTP2
350GOTO160
360PRINT'"CHANGING P.3":INPUTP3
370GOTO160
380PRINT'"CHANGING N.1":INPUTN1
390GOTO160
400PRINT'"CHANGING N.2":INPUTN2
410GOTO160
420PRINT'"CHANGING N.3":INPUTN3
430GOTO160
440PRINT'"CHANGING AA":INPUTAA
450GOTO160
460PRINT'"CHANGING AD":INPUTAD
470GOTO160
480PRINT'"CHANGING AS":INPUTAS
490GOTO160
500PRINT'"CHANGING AR":INPUTAR
510GOTO160
520PRINT'"CHANGING TARG.A":INPUTTA
530GOTO160
540PRINT'"CHANGING TARG.D":INPUTTD
550GOTO160
560PRINTTAB(0,15);"ENVELOPE ";N;",";S;",";P1;",";P2;",";P3;",";
N1;",";N2;",";N3;",";AA;",";AD;",";AS;",";AR;",";TA;",";TD
570PRINT'"SOUND ";CH;",";N;",";W;",";Q
580PRINT'"HAVE YOU FINISHED(' '(N)OR KEY(Y))"
590IF GET$=" "THEN70ELSE50
600PRINT"PITCH'P' OR AMPLITUDE'A'":EF$=GET$
610MODE4
620IFEF$="P" THEN 690
630IFEF$="A" THEN 650
640GOTO600
650PRINTTAB(10,0);"AMPLITUDE ENVELOPE"
660PROCDRAW(AA,AD,AS,AR)
670MODE6
680GOTO160
690PRINTTAB(10,0);"PITCH ENVELOPE"
700PROCDRAW(P1,P2,P3,0)
710MODE6
720GOTO160
730DEFPROCDRAW(D,E,R,T)
740H=0:Q1=1
750MOVE0,0
760F=1280/(N1+N2+N3+Q1)
770U=1024/(ABS(D)+ABS(E)+ABS(R)+ABS(T))
780Y=H+(D*N1)*U
790IFH>950 H=500:U=U/2:GOTO780
800IF Y>1000 U=U/1.2:GOTO780
810IF Y<0 ANDH<1000 H=H+50:MOVE0,H:GOTO780
820X=N1*F
830X2=X+N2*F
840Y2=Y+(E*N2)*U
850IFY2>1000 U=U/1.2:GOTO780
860IFY2<0 ANDH<1000 H=H+50:MOVE0,H:GOTO780
870Y3=Y2+(R*N3)*U
880IFY3>1000 U=U/1.2:GOTO780
890IFY3<0ANDH<1000 H=H+50:MOVE0,H:GOTO780
900X3=X2+N3*F
910X4=X3:Y4=Y3
920IFT>-1 GOTO940
930REPEAT:X4=X4+F:Y4=Y4+(T*U):IFX4>1280 Q1=Q1+5:GOTO760ELSE UNT
ILY4<=0
940DRAWX,Y
950DRAWX2,Y2:DRAWX3,Y3
960DRAWX4,Y4
970PRINTTAB(10,2);"ANY KEY TO CONTINUE":D=GET
980ENDPROC
990IFERR=44 GOTO620ELSEREPORT
```



Oric 1 Raspo

by Aiden & Philip Emery

'Raspo' is a fairly simple maze game for the 16 or 48k Oric 1.

Raspo is a disillusioned space invader. Tired of invading planet after planet only to get vapourised for his troubles, Raspo wants nothing more than to settle down in a quiet seaside home for retired space invaders. Unfortunately, a bunch of arcade addicts have other ideas. To enable him to live out a long and happy retirement, you must guide him safely through a maze full of dangers to the teleport cubicle at the other side. You control Raspo using the cursor control keys. Whenever he hits anything, Raspo will bounce off the object making the task of manoeuvring him decidely tricky.

The maze is a simple one, and its primary appeal is likely to be to younger children, who will no doubt enjoy the sound effects.

Owners of 16k machines should alter line 23 to read 00=0.

PROGRAMS

```
23 OO=£8000
28 GOTO 1200
30 IF PEEK(X)=251 AND M<>0 THEN M=-M:X=X+M:PLAY 1,0,1,2000:RETURN
40 IF PEEK(X)=251 AND U<>0 THEN U=-U:X=X+U:PLAY 1,0,1,2000:RETURN
50 IF PEEK(X)=95 THEN 550
60 IF X=15390+OO THEN 300
70 END
100 REM MAIN LOOP
110 POKE X,125:PRINTCHR$(30)
120 PRINTCHR$(11);T
130 T=T+1
140 Q=X
150 X=X+U:X=X+M
160 MUSIC 1,1,(T AND 11)+1,0
170 IF PEEK (X)<>32 THEN GOSUB 30
180 IF PEEK(520)=188 THEN M=1:U=0 :GOTO220
190 IF PEEK(520)=156 THEN M=0:U=-40:GOTO220
200 IF PEEK(520)=180 THEN M=0:U=40:GOTO220
210 IF PEEK(520)=172 THEN M=-1:U=0
220 POKE X,125
230 POKE Q,32
240 IF X=15390+OO THEN 300
250 GOTO 110
260 END
300 REM FINISH
301 POKE X,125:POKE Q,32
302 ZAP:WAIT10:ZAP:WAIT 20:SHOOT:WAIT20
303 POKE X,43:WAIT 20
305 PRINTCHR$(20)
310 Z$=KEY$
320 IF T>TS(0) THEN GOTO 1000
330 CLS:PAPER 1
340 FOR I=0TO26:PLOTO,I,10:NEXT
350 PRINTCHR$(4)
360 PRINT"RASPO is very grateful and would"
365 PRINT
370 PRINT"like your name for future reference."
380 PRINT:PRINT:PRINT
390 L=0:NA$="":I$=""
400 PRINT"    >>>";
410 REPEAT
420 :NA$=NA$+I$
430 :PRINTI$;
440 :GETI$
450 UNTIL ASC(I$)<32
460 PRINTCHR$(4);CHR$(20);
470 IF LEN (NA$)>25 THEN NA$=LEFT$(NA$,25)
480 TS(0)=T:TS$(0)=NA$
490 FOR I=0TO8
500 :IF TS(I)<TS(I+1) THEN GOSUB 1150
510 NEXT:GOTO 1000
520 END
550 REM KILLED
555 Z$=KEY$
560 POKE X,125:POKE Q,32
570 MUSIC 1,1,1,0:PLAY 0,7,5,50:WAIT 100:PLAY 0,0,0,0:EXPLODE
580 FOR I=1TO5:PAPER 5:INK 1:WAIT 5:PAPER 3:INK 0:WAIT 5:NEXT:WAIT
10
590 CLS:PRINT:PRINT:PRINT
600 PAPER 0:INK 6
610 PRINTCHR$(4);CHR$(27);"NHIGH VOLTAGE!"
615 PRINT:PRINT
620 PRINTCHR$(4):PRINT"RASPO'S BEEN ELECTROCUTED.....R.I.P"
625 PING:WAIT 40
630 FOR I=1 TO LEN(TU$):NO$=MID$(TU$,I,1):NO=VAL(NO$):MUSIC1,2,NO,0
632 MUSIC 2,1,NO,0:PLAY 3,0,5,150 :WAIT 30:NEXT:WAIT30:PLAYO,0,0,0
635 WAIT 20
640 GOTO 1000
650 REM INSTRUCTIONS
655 Z=90
660 CLS:PAPERO:X=15355+OO:U=0:M=1:T=0:G=1:INK 6
665 PRINT:PRINT
670 PRINT:PRINTCHR$(4);CHR$(27);"J RASPO THE BOUNCY";CHR$(4)
680 FOR I=1 TO 6
690 PLOT 0,I,17
700 NEXT
705 IF VR=1 THEN VR=0:GOTO 850
710 PLOT 0,26,20:PLOT 1,26,7:PLOT 2,26,"More from RASPO in a moment
....."
720 PRINT:PRINT:PRINT:PRINT
730 PRINT"  Use the arrow keys at the bottom of the keyboard to cha
nge";
740 PRINT" the direction":PRINT"of RASPO the bouncy space-invader w
ho"
750 PRINT"is trying to escape the clutches of   the ARCADE ADDICTS
who want";
760 PRINT" to":PRINT"vapourize him."
770 PRINT:PRINT" ";CHR$(27);"E HIT ANY KEY TO START GAME"
780 PRINT:PRINT" ";CHR$(27);"CINSTRUCTIONS CONTINUE ON NEXT PAGE"
790 Z=Z+1:A$=STR$(Z):PLOT 0,0,"     "
792 Z$=KEY$
795 PLOT 0,0,A$
810 IF Z$<>"" THEN GOTO 2000
```

PROGRAMS

```
820 WAIT 07:IF Z>165THENGOTO840
830 GOTO 790
840 VR=1:GOTO 660
850 PLOT 0,26,20:PLOT 1,26,7:PLOT 2,26,"Hiscores in a moment....."
860 PRINT:PRINT:PRINT:PRINT
870 PRINT"Your objective is to guide him thro'  the maze,avoiding t
he hazards ";
880 PRINTCHR$(4);CHR$(27);"J(_)";CHR$(4)
900 PRINT"which are scattered around."
902 PRINT:PRINT:PRINT
905 PRINT" ";CHR$(27);"C";
910 PRINT"You have to make him hit the target"
915 PRINT" ";CHR$(27);"Cin the top right-hand corner ";
920 PRINTCHR$(4);CHR$(27);"J (+)";CHR$(4)
940 PRINT" ";CHR$(27);"C";
950 PRINT"from where he will teleport to";CHR$(27);"J"
960 PRINT" ";CHR$(27);"C";
970 PRINT"the home for retired space-invaders."
980 PRINT:PRINT"Your time is displayed at the top-left"
990 REPEAT:CO=CO+1:Z$=KEY$:IF Z$<>"" THEN PULL:GOTO 2000
995 UNTIL CO=700
1000 REM HISCORES
1005 PING
1010 CLS:PAPER0:INK0
1020 FOR I=0TO26:PLOT 1,I,10:NEXT
1030 PRINTCHR$(4)
1040 PRINTCHR$(9);"      FASTEST TIMES"
1050 FOR I=9TO0STEP-1
1060 :PRINT
1070 :T$=STR$(TS(I))
1080 :T$=RIGHT$("          "+RIGHT$(T$,LEN(T$)-1),9)
1090 :PRINT T$,TS$(I)
1100 NEXT
1110 FOR I=0 TO 26:PLOT 1,I,10:NEXT
1120 INK 3
1130 PRINTCHR$(4);
1139 CO=0
1140 REPEAT:CO=CO+1:Z$=KEY$:IF Z$<>"" THEN PULL:GOTO 2000
1145 UNTIL CO=300
1147 GOTO 650
1150 REM MOVE UP LADDER
1160 G=TS(I):TS(I)=TS(I+1):TS(I+1)=G
1170 G$=TS$(I):TS$(I)=TS$(I+1):TS$(I+1)=G$
1180 RETURN
1200 REM INITIALISE HISCORES
1210 FOR I=9 TO 0 STEP-1:TS$(I)="    ORIC":TS(I)=400-20*I:NEXT
1220 T$=""
1250 REM INITIALISE VARIABLES
1260 CLS:PAPER4:INK 7
1270 FOR I=14312+00TO14319+00:READA:POKEI,A:NEXT
1280 FOR I=13656+00TO13663+00:READA:POKEI,A:NEXT
1290 FOR I=14296+00TO14303+00:READA:POKEI,A:NEXT
1300 FOR I=14072+00TO14079+00:READA:POKEI,A:NEXT
1310 POKE£26A,10
1320 G=1:X=15355+00:U=0:M=1:PRINTCHR$(20)
1330 TU$="33336553313"
1340 GOTO 650
1350 REM DRAW WALLS
1355 G=1:X=15355+00:U=0:M=1:T=0:CM=FRE("")
1360 CLS:PAPER3:INK0:PRINTCHR$(27);"G";CHR$(27);"P"
1365 RESTORE:FORI=1TO32:READN:NEXT
1370 FOR J=1TO5
1380 READN
1390 FORI=1TO38:PLOTI,N,251:NEXT
1400 NEXT J
1410 FOR I=1TO26:PLOT 1,I,251:NEXT
1420 FOR I=1TO26:PLOT19,I,251:NEXT
1430 FOR I=1TO26:PLOT38,I,251:NEXT
1450 REM BOLLARDS
1460 FOR I=1TO20
1470 W=INT(RND(1)*32):W=W+2:IFW=18ORW=20 THEN 1470
1480 E=INT(RND(1)*24):E=E+2:IFE=6ORE=8ORE=12ORE=14ORE=18ORE=20THEN1
480
1490 PLOT W,E,251
1500 NEXT I
1550 REM TARGET,HAZARDS,GAPS
1560 FOR I=1TO6:A(I)=(RND(1)*16):A(I)=A(I)+2:NEXT
1570 PLOT A(1),7," "
1580 PLOT A(2),13," "
1590 PLOT A(3),19," "
1600 PLOT (A(4)+18),7," "
1610 PLOT (A(5)+18),13," "
1620 PLOT (A(6)+18),19," "
1630 A(7)=INT(RND(1)*5):A(7)=A(7)+20
1640 FOR I=1TO6
1650 V(I)=INT(RND(1)*38)+1
1660 L(I)=INT(RND(1)*27)+1
1670 IF V(I)=18ORV(I)=19ORV(I)=20THEN1650
1680 IFL(I)=25ORL(I)=26ORL(I)=27ORL(I)=12ORL(I)=13ORL(I)=14ORL(I)=6
THEN1650
1690 IFL(I)=7ORL(I)=8ORL(I)=18ORL(I)=19ORL(I)=20 THEN 1650
```

```
1700 IF V(I)=36ANDL(I)=3THEN1650
1710 PLOT V(I),L(I),"_"
1720 NEXT
1730 PLOT 19,A(7),"* "
1740 PLOT 37,2,"+"
1750 GOTO 100
1800 REM DATA FOR CHARACTERS
1810 DATA 0,4,14,31,21,31,10,17
1820 DATA 0,8,28,42,62,42,28,8
1830 DATA 63,33,33,33,33,33,33,63
1840 DATA 14,21,14,14,27,10,4,10
1850 REM DATA FOR WALLS
1860 DATA 1,26,13,7,19
1900 REM GO
2000 CLS:LORES1
2001 INK 1
2002 PRINTCHR$(4)
2010 FOR I=0 TO 26:PRINTCHR$(27);"O":NEXT:PRINTCHR$(30)
2020 PRINT:PRINT:PRINT:PRINT
2030 PRINT"       ______       ______"
2035 PRINT
2040 PRINT"   __          __         __"
2045 PRINT
2050 PRINT"   __    ___   __         _"
2055 PRINT
2060 PRINT"   __     __   __         __"
2065 PRINT
2070 PRINT"     ______        ______   __ __"
2075 PRINT
2080 PRINTCHR$(4)
3030 WAIT 500:GOTO 1350
```

BBC Bearings

by E Swarbrick

'Bearing' is a useful aid to geographers and hikers! It runs on both models.

Given two ordnance survey map coordinates in the form NW123456, the program calculates the distance between them in both miles and kilometres together with the bearing of the second point from the first. As well as ensuring that each coordinate is entered in a valid format, 'Bearings' also ensures that both coordinates are in mainland Britain.

Another simple, yet well thought out and useful program.

```
   100 REM......O.S. MAP BEARINGS
   110 REM....E.B. Swarbrick_____JAN '83
   120 MODE7
   130 @%=&20209:REM.    2 Decimal places

   140 MAP$="SUSWSXSYSZTU**********SRSSST
SUTQTR********SMSNSOSPTLTM**********SHSJ
SKTFTG**********SCSDSETA**********NWNXNY
NZ************NRNSNTNU**********NLNMNNNO
************NFNGNHNJNK**********NANBNCND
******************HYHZ"
   150 PROCINTRO
   160 CLS
   170 FLAG1%=0
   180 PRINTTAB(3,7)CHR$131;"INPUT CO-ORD
S OF FIRST POINT.."
   190 PRINTTAB(30,9)"          ":REM....
Delete any info already there.
   200 PRINTTAB(4,9);CHR$132;"(e.g. AB123
987)........";CHR$130;:INPUTANSWER$
   210 PROCVALID
   220 PROCSEARCH
   230 REFERENCE1$=ANSWER$
   240 MAP1%=FNSCAN(ANSWER$):REM...Which
map is this location in?
   250 FLAG1%=1:REM.....1st input O.K.
   260 PRINTTAB(3,11)CHR$131;"INPUT CO-OR
DS OF SECOND POINT.."
   270 PRINTTAB(30,13)"          "
   280 PRINTTAB(4,13);CHR$132;"(e.g. AB12
```

PROGRAMS

```
3987)........";CHR$130;:INPUTANSWER$
  290 PROCVALID
  300 PROCSEARCH
  310 REFERENCE2$=ANSWER$
  320 MAP2%=FNSCAN(ANSWER$):REM...Which
   map is this location in?
  330 REM.....Find separation of the two
   co-ordinates by refering each to the
   bottom left corner of the British Isl
es O.S. Plan.
  340 REM....Vertically
  350 VERTREF1=(INT(MAP1%/10)-1)*100+(VA
L(MID$(REFERENCE1$,6,3)))/10
  360 VERTREF2=(INT(MAP2%/10)-1)*100+(VA
L(MID$(REFERENCE2$,6,3)))/10
  370 VERTSEP=ABS(VERTREF1-VERTREF2):REM
....Vertical separation.
  380 V%=SGN(VERTREF2-VERTREF1):REM..Up
   is positive.
  390 REM....Horizontally
  400 HORREF1=(MAP1%-INT(MAP1%/10)*10-1)
*100+(VAL(MID$(REFERENCE1$,3,3)))/10
  410 HORREF2=(MAP2%-INT(MAP2%/10)*10-1)
*100+(VAL(MID$(REFERENCE2$,3,3)))/10
  420 HORSEP=ABS(HORREF2-HORREF1):REM...
  ..Horizontal separation.
  430 U%=SGN(HORREF2-HORREF1):REM...East
   is positive.
  440 PATH=SQR(VERTSEP*VERTSEP+HORSEP*HO
RSEP):REM.....Path length in kilometers.
  450 PRINTTAB(2,15)CHR$133;"Path length
 is";CHR$129;PATH;" kilometers."
  460 PRINTTAB(17,16)CHR$129;PATH*0.6213
7;" miles."
  470 PRINTTAB(2,18)CHR$134;"Bearing is
True ";CHR$129;FNbearing(VERTSEP,HORSEP)
  480 PRINTTAB(2,23)CHR$133;CHR$136;"Pre
ss any key to continue......."
  490 ZZZZ=GET
  500 GOTO160:REM.....start again.
  510 END
  520 DEF PROCINTRO
  530 CLS
  540 PRINTTAB(10,3)CHR$141;CHR$130;"O.S
 MAP BEARINGS"
  550 PRINTTAB(10,4)CHR$141;CHR$130;"O.S
.MAP BEARINGS"
  560 PRINTTAB(3,7)"This program will gi
ve you the "'"bearings and distance betw
een any two"'"points in mainland Britain
."'"   The input prompts request a two "
'"letter and six figure O.S. co-ordinate
"

  570 PRINTTAB(15,13)CHR$129;"e.g. NW123
678"
  580 PRINTTAB(3,23)CHR$131;CHR$136;CHR$
157;CHR$132;"press any key to start....
";CHR$156
  590 ZZZZ=GET
  600 ENDPROC
  610 DEF PROCVALID
```

PROGRAMS

```
  620 PRINT TAB(2,1)SPC(37):REM....Delet
e     any message already there.
  630 IF LEN(ANSWER$)<>8 THEN PROCMISTAK
E
  640 ENDPROC
  650 FOR LOOP%=1 TO 8
  660   REM.....Examine each character i
n  turn for validity
  670   CHAR%=ASC(MID$(ANSWER$,LOOP%,1))
  680   IF (CHAR%<65 OR CHAR%>90) AND (L
OOP%=1 OR LOOP%=2)THEN PROCMISTAKE
  690   IF (CHAR%<48 OR CHAR%>57) AND LO
OP%>2 THEN PROCMISTAKE:LOOP%=9
  700   NEXT
  710 ENDPROC
  720 DEF PROCMISTAKE:REM..Report errors
  730 VDU7:REM....Beep
  740 PRINTTAB(2,1)"You have input duff
gen...TRY AGAIN!"
  750 IF FLAG1%=0 GOTO 180
  760 IF FLAG1%=1 GOTO 270
  770 ENDPROC
  780 DEF PROCSEARCH
  790 X$=LEFT$(ANSWER$,2)
  800 FOR LOOP%=1 TO LEN(MAP$) STEP2
  810   IF X$=MID$(MAP$,LOOP%,2) THEN EN
DPROC
  820   NEXT
  830 PROCMISTAKE
  840 ENDPROC
  850 DEF FNSCAN(S$)
  860 X$=LEFT$(S$,2)
  870 =(INSTR(MAP$,X$)+1)/2
  880 DEF FNbearing(LONG,LAT)
  890 LOCAL angle
  900 REM...first check for North,South,
East or West to prvent division by zero.
  910 IF V%=1 AND U%=0 THEN ="NORTH"
  920 IF U%=1 AND V%=0 THEN ="EAST"
  930 IF V%=-1 AND U%=0 THEN ="SOUTH"
  940 IF U%=-1 AND V%=0 THEN ="WEST"
  950 IF U%=0 AND V%=0 THEN PRINTTAB(2,1
7);SPC(17):VDU13:="       SAME LOCATION
S.  TRY AGAIN"
  960 angle=DEG(ATN(LAT/LONG))
  970 REM..now determine which quadrant
 the angle is in and adjust accordingly.
  980 IF V%=-1 AND U%=1 quad=-180
  990 IF V%=-1 AND U%=-1 quad=180
 1000 IF V%=1 AND U%=-1 quad=-360
 1010 IF V%=1 AND U%=1 quad=0
 1020 =ABS(angle+quad)
>V.3
```

Lynx Star Trek

by B Coupe

We had a number of calls from frustrated Lynx owners who were unable to read parts of the 'Star Trek' listing in last month's Programs. Apologies to all concerned, and here it is again in its entirety. (The accompanying notes can be found in

PROGRAMS

the October issue pp. 272-3.)

A reminder that the program occupies all but ten bytes of the available memory without remarks. Entering even a single REM statement will cause the program to crash!

```
100 CODE 3F 3F 3F 3F 3F 3F 3F 3F 3F 3F 02 12 0A 07 3F 07 0A 12 02 00 00 10 20 00
 38 00 20 10 00 00 00 00 00 3F 3F 00 00 00 00 00 00 00 00 3C 3C 24 1E 3F 2A 3F 0
1 03 1F 1F 09 0A 0C 3E 2A 3E 00 00 00 00 07 3F 07 00 00 00 00 00 10 30 3F 3F 3F
30 10 00 00 00
109 REM CHR$(136) IS BY-PASSED
110 CODE 00 0F 1E 3C 3C 00 3C 3C 1E 0F 00 00 00 00 00 00 07 0F 1F 3E 0E 0E 08 08
 08 08 3F 3F 3F 0C 00 00 00 00 00 00 38 3C 3E 3F 00 00 0F 13 23 23 13 0F 00 00 1
F 3F 3F 3F 3F 3F 3F 3F 3F 1F 00 20 3C 3A 39 39 3A 3C 20 00 08 08 08 08 08 08 08
08 08 08 00 00
120 DPOKE GRAPHIC,LCTN(100)
130 PAPER BLACK
140 CLS
150 PRINT @ 49,120;"STAR TREK"
159 REM A(0)=ALERT INK COLOUR, A(1)-A(243)=QUADRANTS TO BE VISITED,
    C(1)-C(9)=USED FOR TEMPORARY STORAGE OF QUADRANT CONTENTS WHEN L.R. SENSORS
    CALLED, D(1)-D(9)=SYSTEMS AND STATE (1=VIDEO, 2=COMPUTER, 3=PHASERS,
    4=WARP DRIVE, 5=PHOTON TORPEDOES, 6=L.R. SENSORS, 7=S.R. SENSORS, 8=IMPULSE
    ENGINES : STATE=3 IF WORKING, 2 IF ALMOST READY, 1 IF OUT OF ORDER),
    E(1)-E(6) HOLD VARIABLES (1=ALERT, 2=ENERGY, 3=PLANETS ORBITED, 4=KLINGONS
    DESTROYED, 5=TORPEDOES LEFT, 6=STARDATE), G(1)-G(5) HOLD VARIABLES WITHIN
    INDIVIDUAL QUADRANT (1=F CLASS STAR, 2=CLASS M PLANET, 3=CLASS G PLANET,
    4=STARBASE, 5=KLINGON, 6=ENTERPRISE), Q(0)-Q(47) HOLDS VALUES WITHIN (6*8)
    QUADRANT
160 DIM A(243),C(9),D(9),E(6),G(5),Q(47),N$(24),T$(30),U$(15)(6),V$(3)(6)
169 REM SET UP VARIOUS STRINGS, LOCATIONS, ETC.
170 FOR I=1 TO 243
180   LET A(I)=RAND(8)+1,Q$=CHR$(128),T$=T$+Q$
190   IF I(9 THEN LET D(I)=3
200 NEXT I
210 FOR I=1 TO 6
220   READ A,B,C,D,E,F,G,U$(I)
230   LET V$(I)=CHR$(A)+CHR$(B)+CHR$(C),E(I)=G
240   IF D=0 THEN GOTO 300
250   FOR S=1 TO D+RAND(E)
260     LET X=RAND(243)+1
270     IF A(X)(9 THEN LET A(X)=0
280     LET A(X)=A(X)+F
290   NEXT S
300 NEXT I
310 LET A(0)=4,Q=X,A(Q)=A(Q)+0.5,A$=CHR$(144)
320 GOSUB 790
329 REM SET UP DISPLAY
330 CLS
340 INK WHITE
350 PRINT @ 3,10;"QUADRANT  "Y;","I;","W; @ 66,10;"STARDATE  2200.00"; @ 27,30;T
$; @ 27,170;T$;
360 FOR L=30 TO 170 STEP 10
370   PRINT @ 24,L;Q$; @ 117,L;Q$;
380 NEXT L
390 FOR L=1 TO 12
400   READ Z$,N$,O
410   LET M=0,U=170
420   IF L)6 THEN LET M=42,U=110
430   PRINT  @ M,U+L*10,Q$Z$A$N$A$"  "Q$;
440 NEXT L
450 GOSUB 2460
460 GOSUB 3740
470 INK GREEN
480 PRINT @ 36,210;Q$Q$;
490 GOSUB 940
500 GOSUB 1070
509 REM MAIN ROUTINE FOR CHOOSING SYSTEM
510 LET K$=GET$
520 DPOKE &620D,&6608 REM REINIALISE STACK
530 RESTORE 680
540 FOR O=1 TO 12
550   READ Z$,N$,L
560   IF Z$=K$ OR Z$=UPC$(K$) THEN GOTO 590
570 NEXT O
580 GOTO 510
590 IF (O)3 AND O(7) OR O=12 THEN GOTO 630
600 IF O)6 THEN LET O=O-3
610 GOSUB 2720 REM TO FIRING SUBROUTINE
620 IF D(O)()3 THEN GOTO 510 REM IF SYSTEM NOT WORKING THEN GOTO MAIN ROUTINE
630 INK BLACK
640 PAPER WHITE
650 GOSUB L REM OR GOTO SYSTEM SUBROUTINE
660 GOTO 510
670 DATA 32,129,130,20,1,20,1, CLASS F STAR,141,142,143,5,1,500,3000,CLASS M PLA
NET,141,142,143,12,20,100,0,CLASS G PLANET,138,139,140,30,30,2000,0,    STARBASE,
134,135,137,8,1,10,3,KLINGON WARSHIP,131,132,133,0,0,0,2200,N
680 DATA V,VIDEO    ,2630,C,COMPUTER,1540,P,PHASERS ,3270,A,ALERT    ,850, ,PLANET
S ,780,R,REPAIRS ,940,W,WARP DRIVE          ,1940,T,PHOTON TORPEDOES   ,3190
690 DATA L,LONG RANGE SENSORS ,1060,S,SHORT RANGE SENSORS,2340,I,IMPULSE ENGINES
    ,3420, ,KLINGONS              ,780
700 DATA -8,-7,1,9,8,7,-1,-9
710 DATA BL. HOLE, O STAR, PULSAR, NOISE,UNKNOWN,UNKNOWN,  VOID,  VOID
719 REM CLEAR DISPLAY AREA
720 LET F=40
730 INK BLACK
740 FOR M=F TO 160 STEP 10
750   PRINT @ 27,M;T$;
760 NEXT M
770 PAPER BLACK
780 RETURN
789 REM OBTAINS CO-ORDINATES OF A(?) - Q=CURRENT QUADRANT
790 LET I=Q DIV 27.1,H=I-1,J=I+1,Y=(Q-I*27) DIV 3.1,X=Y-1,Z=Y+1,W=((Q-1)-I*27) M
OD 3+1
800 IF H=-1 THEN LET H=8
810 IF J=9 THEN LET J=0
820 IF X=-1 THEN LET X=8
830 IF Z=9 THEN LET Z=0
840 RETURN
849 REM ALERT
850 PRINT @ 9,210;"G,Y OR R";
860 IF INP(&0380)=239 THEN LET E(1)=1,A(0)=4
870 ELSE IF INP(&0480)=253 THEN LET E(1)=2,A(0)=6
880 ELSE IF INP(&0380)=253 THEN LET E(1)=3,A(0)=2
```

```
890 ELSE GOTO 860
900 PRINT @ 9,210;CHR$(18)N$"    "; @ 33,210;A$;
910 INK A(0)
920 PRINT Q$Q$;
930 RETURN
939 REM REPAIRS
940 PAPER BLACK
950 INK WHITE
960 FOR T=1 TO 8
970   LET C$="OO",B=36,C=170
980   IF T)3 THEN LET B=111,C=140
990   IF RAND(2) THEN LET D(T)=D(T)+1
1000   IF D(T))2 THEN LET D(T)=3,C$="OK"
1010   IF D(T)=2 THEN LET C$="AR"
1020   PRINT @ B,C+T*10;C$;
1030 NEXT T
1040 IF Z$="R" THEN LET E(2)=E(2)*0.95
1050 GOTO 3740
1059 REM L.R. SENSORS
1060 GOSUB 720
1070 INK MAGENTA
1080 GOSUB 790
1090 PRINT @ 30,40;Q$"   "H;"    "Q$"   "I;"    "Q$"   "J;"    "Q$ ; @ 27,70;X;
@ 27,110;Y; @ 27,150;Z; @ 27,50;T$; @ 27,90;T$; @ 27,130;T$;
1100 FOR L=60 TO 140 STEP 40
1110   PRINT @ 111,L;Q$;W-1; @ 111,L+10;Q$;W; @ 111,L+20;Q$;W+1;
1120 NEXT L
1130 LET F=H,B=3
1140 GOSUB 1180
1150 LET F=I
1160 GOSUB 1180
1170 LET F=J
1179 REM L.R. PRINT TO SCREEN
1180 LET C(1)=X*3+F*27+W-1,B=B+27,N=50
1190 IF C(1) MOD 27=0 THEN LET C(1)=C(1)+27
1200 FOR L=2 TO 9
1210   LET C(L)=C(L-1)+1
1220   IF C(L) MOD 27=1 THEN LET C(L)=C(L)-27
1230 NEXT L
1240 FOR D=1 TO 9
1250   LET A=A(C(D)),N=N+10
1260   GOSUB 1320
1270   PRINT @ B,N;Q$C$;
1280   IF D MOD 3=0 THEN LET N=N+10
1290 NEXT D
1300 RETURN
1309 REM DETERMINES CONTENTS OF QUADRANT
1310 LET A=A(Q)
1320 FOR M=1 TO 5
1330   LET G(M)=0
1340 NEXT M
1350 IF A)9 THEN GOTO 1410
1360 RESTORE 710
1370.FOR U=1 TO A
1380   READ C$
1390 NEXT U
1400 RETURN
1410 LET M=2000,T=1
1420 GOSUB 3810
1430 LET M=500,T=2
1440 GOSUB 3810
1450 LET M=100,T=3
1460 GOSUB 3810
1470 LET M=20,T=5
1480 GOSUB 3810
1490 LET M=10,T=4
1500 GOSUB 3810
1510 IF G(4))1 THEN LET G(4)=1
1520 LET C$="K"+CHR$(48+G(5))+"B"+CHR$(48+G(4))+"S"+CHR$(48+G(1))+"P"+CHR$(48+G(
2)+G(3))
1530 RETURN
1539 REM COMPUTER
1540 GOSUB 720
1550 INK GREEN
1560 PRINT @ 48,40;"SCAN TO LOCATE"; @ 33,70;"1. KLINGONS"; @ 33,100;"2. UNEXPLO
RED AREAS"; @ 33,130;"3. PLANETS"; @ 33,160;"4. STARBASES";
1570 GOSUB 3780
1580 IF O(1 OR O)4 THEN GOTO 1570
1590 GOSUB 1890
1600 SWAP D,Q
1610 PRINT @ 45,50;
1620 GOTO 1590+O*40
1630 PRINT"    KLINGONS";
1640 LET O=5,S=5
1650 GOTO 1770
1660 REM
1670 PRINT"UNEXPLORED AREAS";
1680 FOR Q=1 TO 243
1690 IF A(Q)=INT(A(Q)) THEN GOSUB 1840
1700 GOTO 1910
1710 PRINT"    PLANETS";
1720 GOTO 1770
1730 REM
1740 REM
1750 PRINT"   STARBASES";
1760 LET S=4
1770 FOR Q=1 TO 243
1780   GOSUB 1310
1790   IF G(O)=0 AND G(S)=0 THEN GOTO 1810
1800   GOSUB 1840
1810 NEXT Q
1820 SWAP D,Q
1830 RETURN
1839 REM PRINTS COMPUTER INFORMATION TO DISPLAY
1840 GOSUB 790
1850 PRINT @ K,L;Y;" "I;" "W;
1860 LET L=L+10
1870 IF L=170 THEN LET L=70,K=K+24
1880 IF K(123 THEN RETURN
1890 LET F=60,S=2
1900 GOSUB 730
1910 INK GREEN
1920 LET K=27,L=70
1930 RETURN
1939 REM WARP DRIVE - ENERGY DECREASES, TIME INCREASES, SETS UP NEW S.R. ARRAY
1940 PRINT @ 51,180;"QUADRANT          ";
1950 GOSUB 3780
1960 PRINT @ 81,180;O;",";
```

```
1970 LET'G=O*3,P=ABS(O-Y)
1980 IF P>4 THEN LET P=9-P
1990 GOSUB 3780
2000 PRINTO;",";
2010 LET G=G+O*27,M=ABS(O-I)
2020 IF M>4 THEN LET M=9-M
2030 GOSUB 3780
2040 IF O>4 THEN GOTO 2030
2050 PRINT O;
2060 LET G=G+O,P=INT(SQR(M*M+P*P))
2070 IF G=0 OR (G MOD 27=0 AND O=0) THEN LET G=G+27
2080 ELSE IF G=244 OR (G MOD 27=1 AND.O=4) THEN LET G=G-27
2090 LET T=180,D=8
2100 GOSUB 3880
2110 LET Q=G,E(6)=E(6)+(10-O)*P/3,E(2)=E(2)-P*O*E(1)
2120 IF A(Q)=INT(A(Q)) THEN LET A(Q)=A(Q)+0.5
2130 GOSUB 790
2140 PRINT @ 33,10;Y;",";I;",";W; @ 96,10;E(6);
2150 GOSUB 3740
2160 GOSUB 2460
2169 REM END
2170 IF E(6)<2500 AND INT(A(Q))<>1 AND INT(A(Q))<>2 THEN GOTO 2340
2180 INK CYAN
2190 CLS
2200 IF E(6)<2500 THEN GOTO 2230
2210 PRINT"OUT OF TIME."
2220 GOTO 2270
2230 GOSUB 1310
2240 IF E(2)>0 THEN PRINT"AFTER FLYING INTO A "C$
2250 ELSE PRINT"AFTER EXPENDING ITS ENERGY"
2260 PRINT"THE ENTERPRISE WAS LOST TO SPACE ON      STARDATE "E(6)
2270 PRINT
2280 PRINT"RATING "E(4)*3+E(3)*8;"%"
2290 PRINT
2300 PRINT"PLAY AGAIN?"
2310 IF INP(&0480)=253 THEN RUN
2320 IF INP(&0480)<>239 THEN GOTO 2310
2330 END
2339 REM S. R. SENSORS
2340 GOSUB 720
2350 IF D(7)<>3 THEN GOTO 510
2360 LET R=0
2370 INK YELLOW
2380 FOR K=55 TO 155 STEP 20
2390   FOR H=73 TO 213 STEP 20
2400     IF Q(R)=0 THEN DOT H,K
2410     ELSE PRINT @ (H-9)/2,K-5;V$(Q(R));
2420     LET R=R+1
2430   NEXT H
2440 NEXT K
2450 RETURN
2459 REM SETS UP S.R. ARRAY
2460 GOSUB 1310
2470 FOR R=0 TO 47
2480   LET Q(R)=0
2490 NEXT R
2500 FOR R=1 TO 5
2510   IF G(R)=0 THEN GOTO 2570
2520   FOR H=1 TO G(R)
2530     LET K=RAND(48)
2540     IF  Q(K)<>0 THEN GOTO 2530
2550     LET Q(K)=R
2560   NEXT H
2570 NEXT R
2580 LET K=RAND(48)
2590 IF Q(K)<>0 THEN GOTO 2580
2600 LET Q(K)=6,E=K
2610 INK YELLOW
2620 RETURN
2629 REM VIDEO
2630 FOR U=0 TO 47
2640   IF Q(U)=0 OR Q(U)=6 THEN GOTO 2700
2650   GOSUB 720
2660   LET V=INT(U/8),H=U-V*8
2670   INK YELLOW
2680   PRINT @ 66,100;V$(Q(U)); @ 45,130;"OBJECT AT "H;",";"V;" IS A"; @ 51,140;U$
(Q(U));
2690   PAUSE 15000
2700 NEXT U
2710 GOTO 2340
2719 REM FIRING SUBROUTINE  - IF KLINGON IN QUADRANT, DOES IT FIRE? IF SO, WHAT
     DAMAGE TO ENTERPRISE?
2720 IF RND>1/(E(1)+1)+0.2 THEN GOSUB 940
2730 GOSUB 1310
2740 IF G(5)=0 OR RND<0.5 THEN RETURN
2750 LET R$=V$(5),S$=V$(6),P$="=",Y$="="
2760 GOSUB 2810
2770 FOR T=1 TO 9-E(1)*2
2780   IF RND<0.5 THEN LET D(RAND(8)+1)=1
2790 NEXT T
2800 GOTO 940
2809 REM PERFORMS ALL KLINGON-ENTERPRISE/ENTERPRISE-KLINGON FIRING ACTIONS
2810 GOSUB 720
2820 INK YELLOW
2830 PRINT @ 66,100;R$;
2840 FOR T=60 TO 27 STEP -1
2850   PRINT @ T,100;P$;
2860 NEXT T
2870 INK BLACK
2880 PRINT @ 27,100;T$;
2890 INK YELLOW
2900 PRINT @ 66,100;S$;
2910 FOR T=27 TO 60
2920   PRINT @ T,100;Y$;
2930 NEXT T
2940 INK BLACK
2950 IF R$=V$(6) AND (Z$="T" OR RND>0.6) AND NOTS$="" THEN GOTO 3000
2960 IF NOTR$=V$(6) THEN LET E(2)=E(2)-RAND(E(2)/(E(1)+1))/3
2970 PRINT @ 27,100;T$;
2980 GOSUB 3740
2990 GOTO 2350
2999 REM ENTERPRISE DESTROYS SOMETHING
3000 PRINT @ 63,100;Q$;
3010 FOR T=1 TO 300
3020   DOT 132+RAND(18),100+RAND(10)
3030 NEXT T
3040 INK YELLOW
3050 IF S$="" THEN GOTO 2350
```

```
3060 IF NOTZ$="P" THEN GOTO 3090
3070 LET U=-1
3075 LET U=U+1
3080 IF Q(U)=5 THEN GOTO 3090
3085 GOTO 3075
3090 IF Q(U)()5 THEN GOTO 3160
3100 LET E(4)=E(4)+1,Q(U)=0,A(Q)=A(Q)-20
3110 IF A(Q)=0.5 THEN LET A(Q)=8.5
3120 PRINT @ 111,230;E(4);
3130 GOSUB 3700
3140 INK BLACK
3150 GOTO 2970
3159 REM IF NOT KLINGON THEN END
3160 CLS
3170 PRINT"YOU FACE COURTS MARTIAL FOR DESTROYING A"U$(Q(U))
3180 GOTO 2270
3189 REM TORPEDOES
3190 IF E(5)=0 THEN RETURN
3200 LET T=190
3210 GOSUB 3840
3220 GOSUB 3910
3230 LET E(5)=E(5)-1
3240 LET R$=V$(6),P$="* ",Y$=" *"
3250 GOSUB 3930
3260 GOTO 2810
3269 REM PHASERS
3270 GOSUB 1310
3280 LET R$=V$(6),S$=V$(5),P$="=",Y$="=",G$=""
3290 IF G(5)=0 THEN LET S$=""
3300 PRINT @ 9,200;"         "; @ 9,200;
3310 LET M=GETN-48
3320 IF M=22 THEN GOTO 3370
3330 IF M(0 OR M)9 THEN GOTO 3310
3340 PRINT M;
3350 LET G$=G$+STR$(M)
3360 GOTO 3310
3370 LET E(2)=E(2)-VAL(G$)
3380 PRINT @ 9,200;CHR$(18)N$;
3390 GOTO 2810
3400 INK BLACK
3410 PAPER WHITE
3419 REM IMPULSE ENGINES : IF DOCKED THEN REPLENISH ENERGY AND TORPEDOES : IF
    ORBIT THEN CLASS M PLANET REVERTS INTO CLASS G PLANET
3420 LET T=220,D=7
3430 GOSUB 3840
3440 GOSUB 3930
3450 GOSUB 3880
3460 LET E(2)=E(2)-O*E(1)/2
3470 IF O)F AND S$="" THEN GOTO 3400
3480 IF O)F OR (O=F AND Q(U)/2()INT(Q(U)/2)) THEN GOTO 3670
3490 IF O=F AND (Q(U)=2 OR Q(U)=4) THEN GOTO 3520
3500 LET Q(E)=0,E=E+P*O,Q(E)=6
3510 GOTO 2340
3520 LET Q(E)=0,E=E+(O-1)*P,Q(E)=6
3530 GOSUB 720
3540 INK YELLOW
3550 PRINT @ 63,100;
3560 IF Q(U)=2 THEN GOTO 3620
3570 PRINT"DOCKED";
3580 LET E(2)=3000,E(5)=3
3590 GOSUB 3740
3600 PAUSE 10000
3610 GOTO 2340
3620 PRINT"ORBIT";
3630 LET E(3)=E(3)+1,Q(E+P)=3,A(Q)=A(Q)-400
3640 GOSUB 3740
3650 PRINT @ 39,220;E(3);
3660 GOTO 3600
3670 CLS
3680 LET C$=U$(Q(U))
3690 GOTO 2240
3699 REM IS MISSION ACCOMPLISHED?
3700 IF E(4)()20 OR E(3)()5 THEN RETURN
3710 CLS
3720 PRINT"MISSION COMPLETE"
3730 GOTO 2270
3739 REM PRINT ENERGY
3740 INK WHITE
3750 PRINT @ 0,90;"ENERGY"; @ 3,100;INT(E(2));"   ";
3760 IF E(2)(=0 THEN GOTO 2180
3770 RETURN
3779 REM INKEY
3780 LET O=GETN-48
3790 IF O(0 OR O)8 THEN GOTO 3780
3800 RETURN
3809 REM USED IN DETERMINING CONTENTS OF Q
3810 IF A(M THEN RETURN
3820 LET G(T)=G(T)+1,A=A-M
3830 GOTO 3810
3839 REM DIRECTION : FOR IMPULSE ENGINES AND TORPEDOES
             1
        8          2
      7              3
        6          4
             5
3840 PRINT @ 51,T;"DIRECTION (1-8)      ";
3850 GOSUB 3780
3860 IF O=0 THEN GOTO 3850
3870 RETURN
3879 REM SPEED : USED FOR WARP DRIVE AND IMPULSE ENGINES
3880 PRINT @ 51,T;"SPEED (1-"D;")          ";
3890 GOSUB 3780
3900 IF O)D THEN GOTO 3890
3910 PRINT @ 51,T;CHR$(18)N$;
3920 RETURN
3929 REM USED FOR TORPEDOES AND IMPULSE ENGINES TO CHECK IF ANYTHING IN THAT
     DIRECTION
3930 RESTORE 700
3940 FOR U=1 TO O
3950   READ  P
3960 NEXT U
3970 LET F=0,U=E,S$=""
3980 IF (U(8 AND (O(3 OR O=8)) OR (U)39 AND O)3 AND O(7) OR (U/7=INT(U/7) AND O)
1 AND O(5) OR (U/8=INT(U/8) AND O)5) THEN RETURN
3990 LET U=U+P,F=F+1
4000 IF Q(U)=0 THEN GOTO 3980
4010 LET S$=V$(Q(U))
4020 RETURN
```

Just because you need it in a flash, don't expose yourself!

You've a deadline to meet, the right CP/M Software package is needed, the right decision has to be made; which format, which product, when can it be delivered, at what price?

You need good advice, and just as important, you need to talk to someone who has a large enough range to be able to offer honest advice. Someone who can then deliver on time, someone whose catalogue is fast becoming the byword of the software industry.

So don't expose yourself, talk to Software Limited. Choice, advice and delivery, all aimed at meeting your deadline.

Software Limited... Because there's more to choose from, we're the only choice to make.

01-833 1173/6

Software Limited
No. 2 Alice Owen Technology Centre
251 Goswell Road, London EC1

CP/M is a trademark of Digital Research

Software Limited

· COME AND MEET US AT COMPEC '83 ·

BACK ISSUES SERVICE

Here is a complete guide to all available back issues of *PCW*. A quick guide to their contents is shown below. Check the coupon overleaf for the issues you require.

Vol 3 No 6 (June 1980)
BENCHTESTS AND REVIEWS
Hardware:
TRS-80 II
Periflex 630/48
Softy Eprom Programmer
Exatron Stringy Floppy
FEATURES
Prestel Report
Z80 Interrupts
IEEE-488 Bus At Work!
PROGRAMS FOR:
PET, Uk101, MK14

Vol 3 No 12 (December 1980)
BENCHTESTS AND REVIEWS
Hardware:
Raannd SP1
Microwriter
Micro Toys
FEATURES
Computer Art
CRAM
PET Pools Predictions
Screen Layouts
PROGRAMS FOR:
TRS-80, PET, MZ80, UK101

Vol 4 No 1 (January 1981)
BENCHTEST
Transam Tuscam

FEATURES
Real Time Control
Finite State Automation
Singing PET
Printer Survey
PROGRAMS FOR:
TRS-80, PET

Vol 4 No 3 (March 1981)
BENCHTESTS AND REVIEWS
Hardware:
Onyx C8002
Bigboard
HP 34C (Calculator)
Software:
MTU Instrument Synthesis
FEATURES
Unix OS
Printerfacing
ALC Circuit
Data Compression
PROGRAMS FOR:
TRS-80, PET

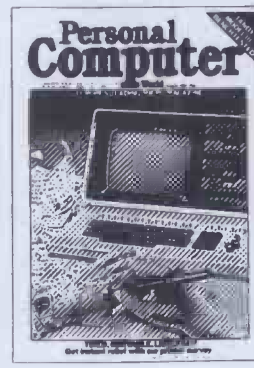
Vol 4 No 5 (May 1981)
BENCHTESTS AND REVIEWS
Hardware:
Pasca 640
PET Chromadaptor
MC Synthesisers (Apple)
Software:
Magic Wand (WP)
MVT Famos (OS)
FEATURES
Tape Operating System
Cash-flow Computing
PROGRAMS FOR:
TRS-80, PET, UK101, Atom

Readers should note that all mail order subscriptions, binders and back issue enquiries must now be addressed to 55 Frith Street, London W1.
However, for personal callers only, a selection of *PCW* back issues, binders, micro-computing books etc can be purchased from the shop at 14 Rathbone Place, London W1.

Vol 4 No 6 (June 1981)
BENCHTESTS AND REVIEWS
Hardware:
NEC PC8001
ZX81
Software:
MP/M (OS)
Wordpro 4
FEATURES
Radio Teletype
Cassette Interface Project
PROGRAMS FOR:
UK101, Zor, PET

Vol 4 No 7 (July 1981)
BENCHTESTS AND REVIEWS
Hardware:
Sharp PC-3201
Acorn Econet
Software:
Format 80 (Apple WP)
FEATURES
Shogi
TRS-80 Accident Research
The Zilog Z8 Family
PROGRAMS FOR:
ZX80, UK101, TRS-80, PET, MZ-80K, ZX81

Vol 4 No 8 (August 1981)
BENCHTESTS AND REVIEWS
Hardware:
Tandy Model III
Lexisoft Spellbinder (WP)
FEATURES
Printer Survey
Viewdata Update

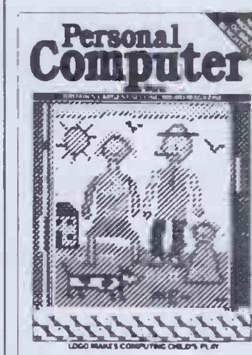


Microholism
PROGRAMS FOR:
ZX80, Apple, MZ-80K, PET

Vol 4 No 12 (December 1981)
BENCHTESTS AND REVIEWS
Hardware:
Sharp MZ80B
Philips P2000
FEATURES
Explor (part 1)
BBC Micro: The Background
Apple Turtle Graphics
School Network
Forth
Cubic Spline Curve Fitting
PROGRAMS FOR:
PET, ZX81

Vol 5 No 3 (March 1982)
BENCHTESTS AND REVIEWS
Hardware:
HP-125
Texas 99/4A
Software:

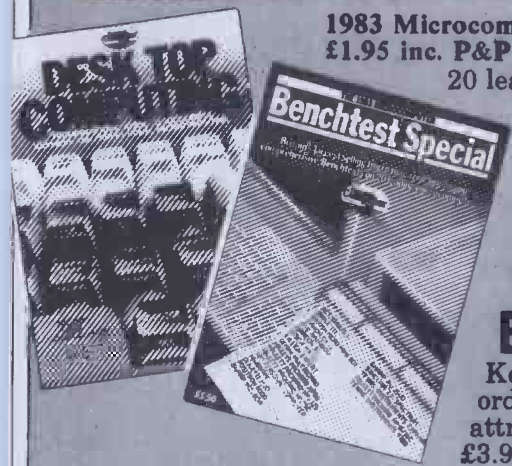
Compsoft DMS
FEATURES
High Density VDU Board (part 2)
Choosing a Database
DP Managers' Guide to Micros (part 3)
3D Graphics
PROGRAMS FOR:
Nascom, ZX81, MZ-80K, TRS-80



Vol 5 No 4 (April 1982)
BENCHTESTS AND REVIEWS
Hardware:
Monroe OC 8820
S100 Colour Board
Software:
FMS-80 (Dbase)
FEATURES
DP Managers' Guide to Micros (part 4)
Logo
DIY Data Screens
Comal-80
High Density VDU Card (part 3)
PROGRAMS FOR:
TRS-80, PET, ZX81

Vol 5 No 6 (June 1982)
BENCHTESTS AND REVIEWS
Hardware:
Spectrum
MZ-80A
Sharp PC1500 (Calculator)
Software:
DBMS2
FEATURES
Lisp
Picture Theory
DP Managers' Guide to Micros (part 6)
PROGRAMS FOR:
RML, VIC20, BBC, MZ-80K

PERSONAL COMPUTER WORLD SPECIALS



1983 Microcomputer Benchtest Special
£1.95 inc. P&P
20 leading micros reviewed by the *PCW* team.

Desktop Computing
£2.25 (inc. P&P)
Comprehensive guide to using micros to help you in your business.

BINDERS
Keep your copies in order with these strong, attractive yellow binders, £3.95 each (inc P&P)

Vol 5 No 7 (July 1982)
BENCHTESTS AND REVIEWS
Hardware:
NewBrain
Mimi 801
Software:
Silicon Office
FEATURES
UCSD p-system (part 1)
Anatomy of the BBC
Micros in the classroom
PROGRAMS FOR:
TRS-80, PET, UK101, Atari

Vol 5 No 9 (September 1982)
BENCHTESTS AND REVIEWS
Hardware:
Microwriter
Olivetti M20
HP15C & HP16C (calculators)
Software:
Aquila (Dbase)
Select (WP)
E40 (File Compressor)
FEATURES
UCSD p-system (part 3)
Logo in Microsoft Basic
RS232 Interface (part 2)
BBC Colour Hi-Res
PROGRAMS FOR:
Apple, Genie, ZX81, PET, BBC, TRS-80

Vol 5 No 10 (October 1982)
BENCHTESTS AND REVIEWS
Hardware:
HP-86
Positron 9000
Software:
Personal Pearl (Dbase)
FEATURES
Benchmarking
BBC Stereo Graphics
File Searching
Database Designing
CP/M-86 vs MS-DOS
Apple II Clock Card (part 1)
PROGRAMS FOR:
Sharp PC-1211 Calculator, ZX81, PET

Vol 5 No 12 (December 1982)
BENCHTESTS AND REVIEWS
Hardware:
Epson HX-20
Walters' 120 dot-matrix printer
Pluto board
Motorola MC68000 educational board
Software:
Computer Scrabble

FEATURES
Ada
Database comparison
Intelligence test for computers
PROGRAMS FOR:
PET, TI99/4A, Atari 400/800

Vol 6 No 3 (March 1983)
BENCHTESTS AND REVIEWS
Hardware:
G007 Graphics Board
Corvus Concept
Lynx
Prophet II
Lisa Mouse
Software:
DataPrism (Dbase)
Wordhandler II (Apple)
VisiOn Mouse
FEATURES
Networking (part 2)
IBM's Secret Micro
Notting Dale ITeC
Enhancing your MZ-80K
PROGRAMS FOR:
Atari, MZ-80K, PET

Vol 6 No 6 (June 1983)
BENCHTESTS AND REVIEWS
Hardware:
Colour Genie
Hitachi MB 16001
Competition Pro Joystick (Spectrum)
Fuller Sound Modules (Spectrum)
Software:
VisiCalc (Apple)
Tomorrow's Office (Sirius Database)
Financial Director
Crossword Magic (Apple)
FEATURES
Occam
Lisp Eliza
Cross Figures
Logo
Accountancy Packages
PROGRAMS FOR:
BBC, Apple, MZ-80K, Oric 1, PET, Commodore 64, Spectrum

Vol 6 No 7 (July 1983)
BENCHTESTS AND REVIEWS
Hardware:
Apple Lisa
Epson QX-10
Osborne Executive
Epson FX-80 Printer
Software:
Microtax (Dragon)
Omnis database
ECalc (Epson HX-20)
PolyForth (IBM PC)
FEATURES
Warnier Orr Programming (part 1)
Choosing Disks
Micronet 800
Cryptography
PROGRAMS FOR:
BBC, Atom, ZX81, Spectrum, Genie, MZ-80K, TRS-80, Apple

Vol 6 No 8 (August 1983)
BENCHTESTS AND REVIEWS
Hardware:
Mannesmann Tally 160L Printer
Vectrex Arcade System
Fortune 32:16
Sord M5
NCR Decision Mate V
Tandy TRS-80 Model 100
Software:
Acornsoft View
Stable Software SCRED
Mathemagic/Graphmagic
Beta
Apple Lisawrite
Dataplan (Dragon)
FEATURES
Warnier Orr Programming (part 2)
BBC Graph Plotting and Curve Fitting
PROGRAMS FOR:
VIC 20, MZ-80K, ZX81, Jupiter Ace, Apple, PET, BBC

Vol 6 No 9 (September 1983)
BENCHTESTS AND REVIEWS
Hardware:
Pied Piper
NEC APC
Micro-Professor II
Software:
Tasword Two
Psion Vu-Calc
Microl The Spreadsheet
Micropro Infostar
FEATURES
Warnier Orr Programming (part 3)
Expert Systems
Sharp Logic
Program conversion
Sirius Graphics (part 1)
Computerising your business (part 1)
Random number generation
PROGRAMS FOR:
Atom, Apple, BBC, Spectrum, Atari, MZ-80K, TRS-80/Genie

Vol 6 No 10 (October 1983)
BENCHTESTS AND REVIEWS
Hardware:
Apricot
Electron
Tulip
Future FX20
Hyperion
MicroDrive
Software:
Sage 400
Micro FCS and Masterplanner
Perfect Calc
Delta
Microsight
FEATURES
Warnier Orr Programming (part 4)
Sirius Graphics (part 2)
PROGRAMS FOR:
Sharp MZ-80K, BBC 'A' and 'B', Lynx, TI99/4A and PET.

Any one issue £1.50; all additional issues £1.00 each. Benchtest special £1.80. Desktop Computing £2.25. Binders £3.95 each. All prices include post and package. *Overseas orders requiring Air Mail postage add £1.00 per copy. Cheques/P.O. payable to Computing Publications Ltd, 53/55 Frith Street, London W1A 2HG. Please allow up to 3 weeks for delivery and don't forget to state your name and full address with your order. Please send me the following copies of PCW. I enclose a cheque/P.O. for £. . . Please tick appropriate boxes.

Volume 1: 1☐ 2☐ 3☐
Volume 3: 6☐ 12☐
Volume 4: 1☐ 3☐ 5☐ 6☐ 7☐ 8☐ 12☐
Volume 5: 3☐ 4☐ 6☐ 7☐ 9☐ 10☐ 12☐
Volume 6: 3☐ 6☐ 7☐
Benchtest Special ☐
Desk Top Computing ☐
Binder ☐

Name ____________ Address ____________

HISOFT PASCAL DEVPAC

Hisoft Pascal 4 is a very fast and powerful microcomputer Pascal compiler that is the result of three years' development work. The compiler conforms very closely to Standard Pascal as described in the Pascal User Manual and Report (Jensen/Wirth) and produces Z80 object code directly in one pass; no P-codes to be subsequently interpreted. HP4 is also small (not more than 19k including runtime routines and tables) but this does not imply any lack of power — the compiler and runtimes were written in Z80 assembler language and a great deal of time was spent on increasing the speed and decreasing the size of the critical routines.

We have designed HP4 to be simple to use, very fast, close to Standard Pascal (with extensions) and inexpensive. Thus we see it as being an attractive package in the educational field (from teaching yourself at home to teaching students at university level) and in the area of systems development. To this end Hisoft Pascal 4 is available in both cassette tape and diskette versions for a wide range of Z80 machines. The tape and disk versions are virtually identical except that the cassette version does not support FILEs, instead the user is given the ability to store and retrieve any variable to and from tape. The tape version (HP4T) is organised in a manner that makes it very easy to adapt to most Z80 systems and we supply details on how to do this in our HP4T Alteration Guide available separately.

In addition to our Pascal we also have available DEVPAC — a Z80 development package which includes a fast and powerful conditional assembler, a labelling disassembler, a debugger with single-step facility (even in ROM) and (on diskette) an extended screen editor. DEVPAC is a highly professional suite of programs which will greatly facilitate your software development.

****STOP PRESS****

Hisoft Pascal now available for the SHARP MZ700!
Pascal for the **ZX SPECTRUM** now includes FREE Logo-style Turtle Graphics!
DEVPAC 3 is now available with *all* the features you will ever need from an assembler/disassembler — see review in Which Micro (September).

****STOP PRESS****

Prices:

HISOFT PASCAL 4 tape version (SHARP MZ80A/K/B, MZ700, NEWBRAIN etc.)	£40.25
HISOFT PASCAL 4 tape version (48k ZX SPECTRUM)	£25
HISOFT PASCAL 4 disk version (SHARP MZ80A/B/K, SUPERBRAIN, RML380Z, 8" formats etc.)	£46
DEVPAC disk version (Gemini G805 or G815 formats)	£46
DEVPAC tape version — ZX SPECTRUM	£14
DEVPAC tape version — NewBrain	£25

All the above prices are fully inclusive of 15% VAT and P&P within the UK. Add £2 for orders to the mainland of Europe and £4 to other countries.

HISOFT

13 Gooseacre Cheddington Leighton Buzzard Beds. LU7 0SR
Tel: (0296) 668995

SCI(UK)

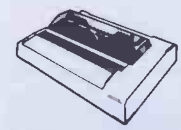
SCI (UK) FREEPOST
PETERSFIELD HANTS GU32 2BR 0730 63741

For the lowest Prices of Printers anywhere in the UK consult this advertisement

NO HIDDEN EXTRAS – The Price you pay is The Price You See
* Send SAE for The 100 Printer Price List *
* WE SUPPLY BUFFERS, RIBBONS, CABLES. ALL TYPES of Non Standard Cables made to order *

We also supply QUME · NEC · TEC · DIABLO · RICHO · CANON · BROTHER · FUJITSU HERMES · TOSHIBA · IDS MICROPRISM · ANADEX · SIEMENS · LUCAS · OLYMPIA

The New HOT SELLING STAR DP 510



- Friction and Tractor Feed Plus Roll Holder AS STANDARD
- 100 CPS
- Bidirectional Logic Seeking
- 9 x 9 Matrix · True Descenders
- 2-3 Buffer AS STANDARD
- Hi-Res Bit Image + Block Graphic Printing Modes.
- Sub and Superscripts
- Italic Printing
- Auto Underlining
- Vertical & Horizontal Tabulation
- Left and Right Margin Set
- Skip Over Perforation
- Back Space
- Self Test

SCI (UK) PRICE only £269.00 VAT & DELIVERY PAID

THE PRICE TEST

Compare Our Prices With THE COMPETITION !

THESE ARE JUST A FEW COMPARISONS – WRITE FOR THE REST !

USUAL PRICE	SCI (UK) PRICE VAT & DELIVERY PAID
EPSON FX80 £428.00 + VAT 80 col/160cps	£424.00
STAR DP510 £289.00 + VAT 80 col/100 cps	£269.00
EPSON RX80FT £319.00 + VAT 80 col/100 cps NEW	£329.00
STAR DP515 £399.00 + VAT 136 col/100 cps	£374.00
EPSON FX100FT £569.00 + VAT 136 col/160 cps NEW	£575.00
SHIWWA CP80 £289.00 + VAT 80 col/100 cps	£269.00

SCI (UK) FREEPOST
PETERSFIELD HANTS GU32 2BR 0730 63741

Sparrow 10

BIG NEWS

THINK CAREFULLY BEFORE YOU BUY YESTERDAY'S TECHNOLOGY

A NEW FAST & RELIABLE MEANS OF DATA STORAGE FOR YOUR COMPUTER SYSTEM.

You don't need to be an expert to appreciate the advantages of the new 'Sparrow 10' range of low cost cartridge disc drives for S-100 and CP/M users. If you have a data storage problem we can help! even if you have Winchesters now, we can still help! We offer a complete plug in and go cartridge disc subsystem that can be installed in your existing S-100 Computer in minutes. These new disc drives use a new type of low cost interchangeable cartridge giving unlimited off-line storage capacity. They are very robust and can even be dropped or walked on without fear of damage. H.B. Systems, as appointed dealer, can supply these drives singly or cased with power supply, controller (for up to four drives) and S-100 interface complete with self installing B10S software that enables a 40 MB subsystem to be up an running within minutes. Prices for S-100 plug-in-and-go systems start from £2,975 + VAT. For further information contact William Isaac on 02372 3304 or complete and clip the coupon.

H.B. Systems

5/6 Queen Street, Bideford, North Devon, EX39 2JG.
Telephone: Bideford (02372) 3304 (3 lines)

Please forward further information to:- PCW/10/83

NAME ....

ADDRESS ....

....

TELEPHONE NO. ....

Signed ....

spectrum

NEWS
from SPECTRUM

TEXAS
The Fabulous TEXAS TI 99/4A-now only £99.95 from SPECTRUM- An incredible Micro Computer Bargain. See our ad,for further details.

ZX SPECTRUM MODEM
Now your SPECTRUM can open up the world - communicate with other computers - Have full access to the PRESTEL data base via your telephone. See our ad for details.

ZX SPECTRUM Joystick interface
Now from SPECTRUM - the PROTEK Joystick Interface for the ZX SPECTRUM - ONLY £14.95

Budget Price JOYSTICKS
Now from SPECTRUM - QUICKSHOT Joysticks only £10.95 - see our ad for details

ATARI
New 600XL model arriving soon! also ATARI VCS Games Machine - see our ad for details

PRESTEL
See PRESTEL Page 600181 for up to date information from SPECTRUM

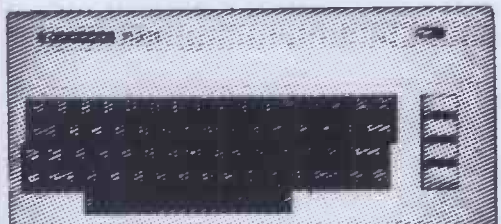
NEW SPECTRUM MEMBERS
Check our address page! - there are many new SPECTRUM dealers throughout the UK so there's a good chance there'll be a SPECTRUM centre near you.

AFTER SALES CARE
SPECTRUM service centres will ensure that should your machine 'go down' we will get it running again as quickly as possible. We also offer extended warranties at reasonable prices too! - ask your SPECTRUM HOME COMPUTER CENTRE for full details

COMPUTER DEALERS
(or prospective Computer dealers!) If, you would like to know more about becoming a SPECTRUM APPOINTED DEALER on an exclusive area basis, please write to MIKE STERN, Spectrum (UK) Ltd., Burrowfield, Welwyn Garden City, Herts. or telephone (07073) 34761

COMMODORE

VIC-20



PACKAGE OFFER!
A complete Home Computer system including the VIC-20 Computer, a Cassette Unit, introduction to BASIC part 1 -a simple explanation of computer programs - Blitz, Type-A-Tune, Race & Hoppit. A fantastic deal!! and great value-for-money. But HURRY! offer only while stocks last.

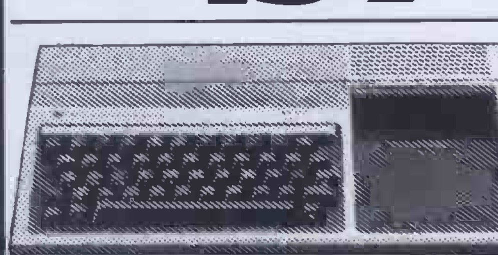
SPECTRUM PRICE £139.99

-64-

SPECTRUM PRICE £229

COMMODORE GAMES
Now all these fantastic ROM games for Comm 64 and VIC-20 from only £9.99 each
Commodore 64 - RADAR, RAT-RACE, SEA WOLF, CLOWNS
Vic-20 - GORF, SARGON 2, CHESS, AVENGER, STAR BATTLE and many more ALL AT ONLY £9.99 each

COMMODORE ACCESSORIES
VIC-1525 Dot Matrix Printe
£212.75
DISC DRIVE £229.00
VIC-1520 4-colour Printer
Plotter £169.99
COM-1701 Colour Monit
(With Sound!) £230.00



TEXAS TI-99/4A
Exceptional value from SPECTRUM and representi probably the finest home micro computer value on t market today! - The TEXAS TI-99/4A is built to an extreme high standard and is highly recommended by SPECTRUM f its utter reliability.

SPECTRUM PRICE £99.95

ORIC-I

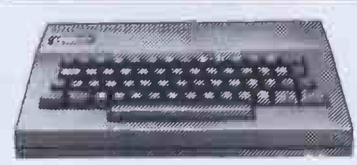
Special
ORIC PRINTER
Get a £40 Cash Voucher redeamable against an Oric Printer when you buy the ORIC-48K computer from SPECTRUM -ask for details

Offering 48K RAM Colour - (8 foreground and 8 background can be displayed at the same time) High resolution graphics User definable Graphics. Full sound (6 octaves of controllable sound) Easy to use keyboard with moving keys. Standard Centronics parallel interface allows easy connection to a wide range of printers etc.

SPECTRUM PRICE £139.95

HALF PRICE OFFER!
Bring a copy of this ad to your local SPECTRUM dealer when you purchase an ORIC-48K and it will entitle you to purchase the ORIC Software Pack containing ■ MULTIGAMES ■ ORICFLIGHT ■ CHESS ■ ZODIAC at Half-Price!

LYNX 96K



■ More power
■ More features

Now from SPECTRUM - the new LYNX 96K offering more workspac for ambitious programs. The most important feature of the 96 machine is its additional memory. In full high resolution colour, it pro vides 37.5K of RAM directly accessible in Basic - with up to 24K mor available to programs using machine code. Ask to see the super ne LYNX 96K at SPECTRUM -NOW!

SPECTRUM PRICE £299

LYNX 48K Model -SPECTRUM PRICE **£225**
For the Lynx owners who're ready to take the next step, the 48K machine c be upgraded to full 96K specification for just £89.95

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

ATARI 800

Check with your local SPECTRUM dealer for our super LOW price

An ideal Home Micro for Graphics, educational and personal finance etc. use it and it will take you from learning up to a small business use. You can add printers, program recorders, disc drives and more, to expand your micro as and when you want to suit your needs. So if you're looking for a top of the line micro you must see the ATARI 800 with 48K at SPECTRUM - NOW!

New! ATARI 600XL

SPECTRUM PRICE

£159.99

ATARI VCS GAMES MACHINE

With all these FREE extras: FREE PADDLES ■ FREE JOYSTICKS ■ FREE COMBAT CARTRIDGE ■ FREE PAC-MAN CARTRIDGE
ALL FOR ONLY **£69.99**

SHARP MZ-80A

Desk top genius! the all-in-one SHARP MZ-80A. Ready to run the moment you get it home. Built-in keyboard. CRT 9" display and cassette data storage with 48K RAM.

SPECTRUM PRICE **£399**

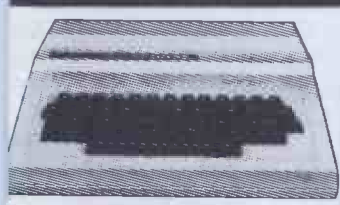
NEW! SHARP 711 Colour Computer

Now available in limited quantities
Spectrum Price

£249.95

inc. FREE Games cassette

DRAGON

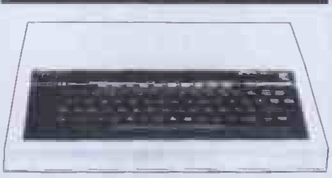


Extensive facilities include highly advanced colour graphics. Powerful standard 32K RAM (expandable to 64K Bytes). ● 9 Colour 5 resolution Display ● Extended Microsoft colour BASIC (as standard) ● Advanced sound with octaves - 255 tones.

£ CHECK WITH YOUR LOCAL SPECTRUM DEALER NOW FOR OUR SUPER LOW PRICE

DRAGON Single DISC DRIVE Now available **£275.00**

BBC



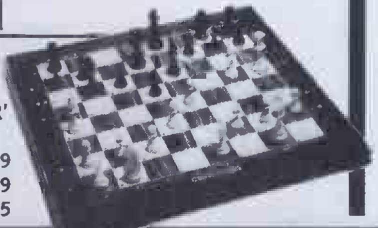
£399

BBC Single Disk Drive 100K	£265.00
BBC Dual Disk Drive 800K	£803.85
BBC Tape Recorder	£29.90
Acorn Software Cassette based from	£9.95
Acorn Disk based sotware	£11.50
BBC cassette based software from	£9.95
BBC BUGGY Spectrum Price	£189.00
IKON FLOPPY TAPE DRIVE for the BBC The ideal alternative! Spectrum Price	£155.25
QUICK SHOT JOYSTICK Especially for the BBC Spectrum Price	£19.95

CONCHESS

The intelligent CHESS COMPUTER'
Models available:

SCORTER	£179.99
AMBASSADOR	£229.99
MONARCH	£279.95



SOFTWARE

- The top sellers from leading British and American Software houses.

SOFTSEL	
ATARI	
Donkey Kong Atari (Cart)	£29.99
Dig Dug Atari (Cart)	£30.00
AVALON HILL	
Computer Stocks & Bonds Com 64 (Cass)	£16.56
Midway Campaign Com 64 (Cass)	£16.56
Telengard Atari (Disk)	£23.18
BRODERBUND	
Choplifter Atari (Disk)	£28.93
Apple Panic Atari (Disk)	£24.79
AE Atari (Disk)	£28.93
Seafox Atari (Disk)	£24.79
Bank Street Writer Atari (Disk)	£56.31
BIG FIVE SOFTWARE	
Miner 2049er Atari (Cart)	£41.70
DATASOFT	
Zaxxon Atari (Disk)	£33.07
EDUCATIONAL SOFTWARE	
Tricky Tutorials 1 to 6 Atari (Disk)	£96.97 (For the 6)
EPYX/AUTOMATED SIMULATIONS	
Jump Man Com 64 (Disk)	£33.07
Temple of Apshai Atari/Vic 20 (Disk)	£33.07
HEYDEN	
Sargon 2 Atari (Disk)	£28.93
Cass	£24.79
HUMAN ENGINEERED SOFTWARE	
Turtle Graphics Com 64 (Cart)	£49.15
Vic 20 (Cart)	£32.75
Heswriter Com 64 (Cart)	£36.85
Vic 20 (Cart)	£32.75
Predator Vic 20 (Cart)	£33.35
CoCo II Com 64 (Disk)	£33.07
Vic 20 (Disk)	£33.07
Simon Vic 20 (Cass)	£13.20
Torg Vic 20 (Cass)	£14.85
6502 Professional Development System Com 64 (Cass)	£24.11
Vic 20 (Cass)	£24.11
INFOCOM	
Zork 1, 2 & 3 Atari (Disk)	£33.07
Com 64 (Disk)	£33.07 (each game)
Deadline Atari (Disk)	£41.35
Suspended Com 64 (Disk)	£41.35
THE MUSE SOFTWARE	
Castle Wolfenstein Atari (Disk)	£22.97
LIGHTNING SOFTWARE	
Master Type Atari (Disk)	£32.16
MIS	
Vic Vango Vic 20 (Cass)	£10.71
Fruit Fly Vic 20 (Cass)	£10.71
PROGRAM DESIGN	
Pre-school IQ Builder Atari (Disk)	£19.28
Cass	£13.77
ROCKLAN	
Wizard of Wor Atari (Disk)	£33.07
Cart	£37.52
SIERRA ON-LINE	
Frogger Atari (Disk)	£27.27
Com 64 (Disk)	£28.93
Ultima II Atari (Disk)	£49.63
Crossfire Vic 20 (Cass)	£24.79
SIRIUS SOFTWARE	
Repton Atari (Disk)	£30.64
Com 64 (Disk)	£33.07
Fast Eddy Com 64 (Disk)	£28.93
Vic 20 (Cart)	£33.35
Squish'em Com 64 (Disk)	£28.93
Type Attack Vic 20 (Cart)	£33.35
Turmoil Vic 20 (Cart)	£33.35
SPINNAKER	
Story Machine Atari (Disk)	£28.14
Rhymes & Riddles Atari (Disk)	£24.11
Snooper Troops Atari (Disk)	£36.19
Hey Diddle Diddle Atari (Disk)	£24.11
In search of the Most Amazing Thing Atari (Disk)	£32.16

MICRO DEALER U.K.	
ZX-SPECTRUM	
QUICKSILVA "XADOM"	£6.95
QUICKSILVA "AQUAPLANE"	£6.95
QUICKSILVA "VELNOR'S LAIR"	£6.95
QUICKSILVA "3-D STRATEGY"	£6.95
QUICKSILVA "SMUGGLERS COVE"	£6.95
IMAGINE "ZZOOM"	£5.50
IMAGINE "ZIPZAP"	£5.50
ULTIMATE "TRANZ AM"	£5.50
ULTIMATE "JET PAC"	£5.50
ULTIMATE "PSST"	£5.50
ULTIMATE "COOKIE"	£5.50
MELBOURNE HOUSE "4-D TERROR-DACTIL"	£6.95
MELBOURNE HOUSE "PENETRATOR"	£6.95
MELBOURNE HOUSE "THE HOBBIT"	£14.95
CRYSTAL COMPUTING "HALLS OF THINGS"	£6.50
NEW GENERATION "KNOT IN 33-D"	£5.95
PSS "LIGHT CYCLE"	£5.95
QUICKSILVA "TIMEGATE"	£6.95
QUICKSILVA "A TRADER TRILOGY"	£9.95
QUICKSILVA "ASTRO BLASTER"	£4.95
QUICKSILVA "FRENZY"	£4.95
RICHARD SHEPHERD "TRANSYLVANIAN TOWER"	£6.50
MICROSPHERE "OMNICALC"	£9.95
PICTURESQUE "EDITOR/ASSEMBLER"	£8.50
PICTURESQUE "SPECTRUM MONITOR"	£7.50
COMMODORE 64	
LLAMASOFT "MATRIX 64"	£7.50
LLAMASOFT "LAZER ZONE"	£7.50
LLAMASOFT "GRIDRUNNER 64"	£5.00
LLAMASOFT "MUTANT CAMELS"	£7.00
INTERCEPTOR "CRAZY KONG"	£7.00
POSTERN "SHADOWFAX"	£7.99
VIC 20	
LLAMASOFT "MATRIX"	£6.00
LLAMASOFT "GRIDRUNNER"	£5.00
LLAMASOFT "LAZER ZONE"	£6.00
QUICKSILVA "SKYHAWK"	£7.95
QUICKSILVA "SUB-SPACE STRIKER"	£7.95
INTERCEPTOR "CRAZY KONG"	£6.00
BBC	
PSION "VU-CALC"	£14.95
PSION "VU-FILE"	£14.95
QUICKSILVA "BEEB-ART"	£14.95
QUICKSILVA "MUSIC PROCESSOR"	£14.95
SOFTWARE INVASION "3-D BOMB ALLEY"	£7.95
DIGITAL FANTASIA "WIZARD OF ACKRYZ"	£9.95
QUICKSILVA "PROTECTOR"	£7.95
POSTERN "SHADOWFAX"	£7.99
DRAGON 32	
SALAMANDER "GRIDRUNNER"	£7.95
PSS "ATTACK!"	£7.95
SALAMANDER "DRAGON TREK"	£9.95
ORIC	
IJK SOFTWARE "XENON-1"	£8.50
IJK SOFTWARE "3-D MAZE"	£7.50
PSS "INVADERS"	£6.95
PSS "CENTIPEDE"	£6.95
SUNSHINE	
Cruising (Dragon 32)	£6.95
Cruising (ZX Spectrum)	£4.95
Blind Alley (ZX Spectrum)	£4.95
Androids (ZX Spectrum)	£5.95
Galaxy Attack (ZX Spectrum 48K)	£5.95
Sword Fight (ZX Spectrum)	£5.95
MICRODEAL	
DRAGON	
The King	£8.00
Space War	£8.00
Defence	£8.00
Alcatraz	£8.00
Katerpillar Attack	£8.00
Space Monolopy	£8.00
Mansion Adventure	£8.00

ACCESSORIES

C12 DATA CASSETTES	£0.50
C15 DATA CASSETTES	£0.58
VISCOUNT SINGLE SIDED, DOUBLE DENSITY (10) (FOR APPLE, COMMODORE, ATARI, TANDY)	£21.25
VISCOUNT SINGLE SIDED, SINGLE DENSITY (10)	£21.25
VISCOUNT DOUBLE SIDED, DOUBLE DENSITY (10) (FOR SHARP SUPERBRAIN, ETC.)	£33.81
VISCOUNT SINGLE SIDED DOUBLE DENSITY 96 TRACK (10) (FOR NASCOM, COMMODORE 8050, ETC.)	£51.36
EMPTY DISK CASES (FOR 5¼" DISKETTES)	£1.95
DISK HEAD CLEANER KIT	£16.10

TELEVISIONS	
12" T80 B&W PORTABLE	£59.95
CTP3131 14" COLOUR PORTABLE	£229.95

COMPUTER CASSETTE RECORDERS from £27.50

QUICKSHOT Joystick For ATARI, COMMODORE, VIC-20 & 64, SPECTRUM & ORIC
ONLY £10.95

BOOKS

GRANADA PERSONAL COMPUTING TITLES	
The ZX Spectrum and how to get the most from it	£5.95
The Spectrum Programmer	£5.95
The Spectrum Book of Games	£5.95
Introducing Spectrum Machine Code	£7.95
The Apple II Programmer's Handbook	£10.95
Programming with Graphics	£5.95
The Dragon & how to make the most of it	£5.95
Computing for the Hobbyist & small Business	£6.95
Simple Interfacing Projects	£6.95
The BBC Micro: An expert guide	£6.95
Commodore 64 Computing	£5.95
The Oric-1 and how to get the most from it	£5.95
The Dragon 32 book of games	£5.95
Computer Languages and their uses	£5.95
Lynx Computing	£6.95
21 Games for the BBC Micro	£5.95
Choosing a Microcomputer	£4.95
Databases for fun & profit	£5.95
Introducing the BBC Micro	£5.95
SUNSHINE	
The Working Spectrum	£5.95
Functional Forth for the BBC	£5.95
The Working Dragon 32	£5.95
Dragon 32 Games Master	£5.95
The Working Commodore 64	£5.95
Commodore 64 Machine Code Master	£6.95
The Working Dragon	£5.95
The Working Spectrum	£5.95
The Working CBM 64	£5.95
Dragon 32 Games Master	£5.95
Functional Forth for the B.B.C.	£5.95
Androids for the 16K Spectrum	£5.95
Sword Fight for 16K Spectrum	£5.95
Galaxy Attack for 48K Spectrum	£5.95
Blind Alley for 16K Spectrum	£5.95
Cruising for 16K Spectrum	£5.95

Not all stores carry every advertised item - please 'phone before making a journey. Prices correct at time of going to press. E.& O.E.

There's a Spectrum Centre near you . .

AVON

BATH Software Plus, 12 York St. TEL: (0225) 61676
BRISTOL Brensal Computers Ltd., 24 Park Row. TEL: (0272) 294188
WESTON-SUPER-MARE K. & K. Computers, 32 Alfred St. TEL: (0934) 419324

BEDFORDSHIRE

BEDFORD Stanad Ltd., 115 Midland Rd. TEL: (0234) 49341
DUNSTABLE Dormans, 7-11 Broad Walk. TEL: (0582) 65515
LEIGHTON BUZZARD The Computer Centre at Milton Keynes Music, 17 Bridge St. TEL: (0525) 382504, 376622
LUTON Terry-More, 49 George St. TEL: (0582) 23391/2

BERKSHIRE

READING David Saunders, 8 Yield Hall Place. TEL: (0734) 580719
WINDSOR Wycombe Video, 44 King Edward Court. TEL: (07535) 67441

BUCKINGHAMSHIRE

BLETCHLEY Rams Computer Centre, 117 Queensway. TEL: TBA
CHESHAM Reed Photography & Computers. 113 High St. TEL: (0494) 783373

CAMBRIDGESHIRE

CAMBRIDGE K. P. Ltd., 12a Kings Parade. TEL: (0223) 68087
PETERBOROUGH Peterborough Communications, 91 Midland Rd. TEL: (0733) 41007

CHANNEL ISLANDS

GUERNSEY Grut's, 3-5 The Pollet, St. Peter Port. TEL: (0481) 24682
JERSEY Audio & Computer Centre, 7 Peter St. St. Helier. TEL: (0534) 74000

CHESHIRE

ALTRINCHAM Mr. Micro, 28 High St. TEL: TBA (Phone (061) 728 2282 for info.)
CREWE Microman, Unit 2, 128 Nantwich Rd. TEL: (0270) 216014
CHESTER Oakleaf Computers Ltd., 100 Boughton. TEL: (0244) 310099
MACCLESFIELD Camera & Computer Centre, 118 Mill St. TEL: (0625) 27468
NORTHWICH Camera & Computer Centre, 3 Town Sq. TEL: (0606) 45629
STOCKPORT Wilding Ltd., 1 Little Underbank. TEL: (061) 480 3435
WARRINGTON Wildings, 111 Bridge St. TEL: (0925) 38290
WIDNES Computer City, 78 Victoria Rd. TEL: (051) 420 3333
WILMSLOW Swift of Wilmslow, 4-6 St. Annes Parade. TEL: (0625) 526213

CLEVELAND

MIDDLESBROUGH McKenna & Brown, 205 Linthorpe Rd. TEL: (0642) 222368

CORNWALL

ST. AUSTELL A B & C Computers, Ouchy House, 6 Lower Aylmer Sq. TEL: (0726) 67337

CUMBRIA

BARROW-IN-FURNESS Barrow Computer Centre, 96 Church St. TEL: (0229) 38353
CARLISLE The Computer Shop, 56-58 Lowther St. TEL: (0228) 27710
KENDALL Ace Computer and Electronics, 185 Highgate, TEL: (0539) 25728
PENRITH Penrith Communications, 14 Castlegate. TEL: (0768) 67146. Open Mon—Fri till 8 p.m.
WHITEHAVEN P. D. Hendren, 15 King St. TEL: (0946) 2063

DERBYSHIRE

ALFRETON Gordon Harwood, 69/71 High St. TEL: (0773) 832078
DERBY C T Electronics, at Camera Thorpe, The Spot. TEL: (0332) 360456

DEVON

EXMOUTH Open Channel, 30 The Strand, TEL: (03952) 4408
PAIGNTON Devon Computers, 81 Upper Manor Rd. TEL: (0803) 526303
PLYMOUTH Syntax Ltd. 76 Cornwall St. TEL: (0752) 28705
TIVERTON Actron Micro Computers, 37 Bampton St. TEL: 0884 252854

DORSET

BOURNEMOUTH Lansdowne Computer Centre, 5 Holdenhurst Rd. TEL: (0202) 20165

DURHAM

DARLINGTON McKenna & Brown, 102 Bondgate. TEL: (0325) 459744

ESSEX

BASILDON Godfrey's 28-32 East Walk, Town Centre. TEL: (0268) 289379
CHELMSFORD Maxton Hayman Ltd., 5 Broomfield Rd. TEL: (0245) 354595
COLCHESTER Colchester Computer Centre, 16 St. Botolphs St. TEL: 0206 47242
GRAYS H. Reynolds, 79 Orsett Rd. TEL: 0375 5948
ILFORD Woolfmans, 76 Ilford Lane. TEL: (01) 478 1307
LOUGHTON Micro & Movie Channel, 309 High Rd. TEL: (01) 508 1216

GLOUCESTERSHIRE

GLOUCESTER The Model Shop, 79-81 Northgate St. TEL: (0452) 410693

HAMPSHIRE

ALDERSHOT David Saunders, 51 Station Rd. TEL: (0252) 20130
ANDOVER Andover Audio, 105 High St. TEL: (0264) 58251
BASINGSTOKE Fisher's, 2-3 Market Place. TEL: (0256) 22079
PORTSMOUTH Computer Corner, 261 Commercial Rd. TEL: (0705) 833938
PORTSMOUTH Waterlooville G B Microland, 7 Queens Prde. TEL: (07014) 59911
SOUTHAMPTON R. J. Parker & Son Ltd., 11 West End Rd., Bitterne. TEL: (0703) 445926
WINCHESTER Winchester Camera & Computer Centre, 75 Parchment St. TEL: (0962) 53982 (Just Opening)

HEREFORD

HEREFORD Melgray Hi-Tech Ltd., 49 Broad St. TEL: (0432) 275737

HERTFORDSHIRE

BOREHAM WOOD Master Micro, 36 Shenley Rd. TEL: (01) 953 6368
HITCHIN Camera Arts (Micro Computer Division), 68a Hermitage Rd. TEL: (0462) 59285
POTTERS BAR The Computer Shop, 197 High St. TEL: (0707) 44417
ST. ALBANS (Herts) Clarks Computer Centre, 14/16 Holywell Hill. TEL: (0727) 52991
STEVENAGE D. J. Computers, 11 Town Sq. TEL: (0438) 65501
WATFORD SRS Microsystems Ltd., 94 The Parade, High St. TEL: (0923) 26602

HUMBERSIDE

GRIMSBY R. C. Johnson Ltd., 22 Friargate, Riverhead Centre. TEL: (0472) 42031

ISLE OF MAN

DOUGLAS T. H. Colebourn Ltd., 57-61 Victoria St. TEL: (0624) 3482 (Just Opening)

KENT

CANTERBURY Kent Micro Systems, Conquest House, 17 Palace St. TEL: (0227) 50200
DOVER Kent Photos & Computers, 4 King St. TEL: 0304 202020
ORPINGTON Ellis Marketing Ltd., 25 Station Sq., Petts Wood. TEL: 0689 39476
RAINHAM Microway Computers Ltd., 39 High St., Medway Towns. TEL: (0634) 376702
SEVENOAKS Ernest Fielder Computers, Dorset St. TEL: (0732) 456800
SITTINGBOURNE Computers Plus, 65 High St. TEL: 0795 25677
TUNBRIDGE WELLS Modata Computers Ltd., 28-30 St. Johns Rd. TEL: 0892 41555

LANCASHIRE

ACCRINGTON PV Computers, 38A Water St. TEL: (0254) 36521/32611
BLACKBURN Tempo Computers, 9 Railway Rd. TEL: 0254 691333
BURNLEY IMO Computer Centre, 39-43 Standish St., BB11 1AP. TEL: (0282) 54299
BURY (Lancs.) Micro-North, 7 Broad St. TEL: (061) 797 5764
OLDHAM Home & Business Computers Ltd., 54 Yorkshire St. TEL: (061) 633 1608
PRESTON Wilding's 49 Fishergate. TEL: (0772) 556250
ROCHDALE Home & Business Computers, 75 Yorkshire St. TEL: TBA

LEICESTERSHIRE

LEICESTER Youngs, 40/42 Belvoir St. TEL: (0533) 544774
MARKET HARBOROUGH Harborough Home Computers, 7 Church St. TEL: (0858) 63056

LINCOLNSHIRE

GRANTHAM Oakleaf Computers Ltd., 121 Dudley Rd. TEL: (0476) 76994/70281
LINCOLN MKO Computers, 24 Newlands. TEL: (0522) 25907

LONDON

E6 Percivals, 85 High St. North, East Ham. TEL: (01) 472 8941
E8 McGowans, 244 Graham Rd., Hackney. TEL: (01) 533 0935
EC2 Devron Computer Centre, 155 Moorgate. TEL: (01) 638 3339/1830
N14 Logic Sales, 19 The Broadway, The Bourne, Southgate. TEL: (01) 882 4942 (Opening Soon)
N20 Castlehurst Ltd., 1291 High Rd. TEL: (01) 446 2280
NW4 DA Vinci Computer Store. 112 Brent St., Hendon. TEL: (01) 202 2272/3/4 (Just Opening)
SE1 Vic Odden's, 6 London Bdg Walk. TEL: (01) 403 1988
SE9 Square-Deal, 375 Footscray Rd., New Eltham. TEL: (01) 859 1516
SE11 Gatwick Computers, 328 Kennington Pk. Rd. TEL: (01) 587 0336
SE15 Castlehurst Ltd., 152 Rye Lane, Peckham. TEL: (01) 639 2205
SW6 Chelsea Micros Ltd., 14 Jerdan Place. Next to Fulham B/way. TEL: (01) 385 8494
W1 Devron 4 Edgware Rd. TEL: (01) 724 2373
W1 Computers of Wigmore Street, 87 Wigmore St. TEL: (01) 486 0373
W1 Sonic Foto & Micro Center, 256 Tottenham Court Rd. TEL: (01) 580 5826
W3 Colormatic Computers, 44 High St., Acton. TEL: (01) 992 7611
W11 Electroleisure, 120 Notting Hill Gate. TEL: (01) 221 7029

MANCHESTER GREATER

MANCHESTER Lomax Ltd., 8 Exchange St., St. Ann's Sq. TEL: (061) 832 6167
SWINTON Mr. Micro Ltd. 69 Partington Lane. TEL: (061) 7282282 'Late Night Friday'
HYDE Pase, 213-215 Market St. TEL: (061) 366 5935
BOLTON Wilding Ltd., 23 Deansgate. TEL: (0204) 33512
WIGAN Wilding Ltd., 11 Mesnes St. TEL: (0942) 44382

MERSEYSIDE

HESWALL Thornguard Computer Systems, 46 Pensby Rd. TEL: (051) 342 7516
LIVERPOOL Beaver Radio, 20-22 Whitechapel. TEL: (051) 709 9898
LIVERPOOL (Aintree) Hargreaves, 31/37 Warbreck Moor. TEL: (051) 525 1782
SOUTHPORT Central Computers, 575 Lord St. TEL: (0704) 31881

MIDDLESEX

EDGWARE Breaker 1-4, 130 High St. TEL: (01) 952 7488/8860
HARROW Camera Arts (Micro Computer Division, 24 St. Ann's Rd. TEL: (01) 427 5469
HAYES Chipstop, 1000 Uxbridge Rd. TEL: (01) 573 2511 (Just Opening)
TEDDINGTON Teddington Camera Centre, Broad St. TEL: (01) 977 4716
UXBRIDGE JKL Computers Ltd., 7 Windsor St. TEL: 0895 51815

NORFOLK

NORWICH Sound Marketing, 52 St. Benedicts St. TEL: (0603) 667725
THETFORD Thetford C B & Micros, 21 Guildhall St. TEL: (0842) 61645

NORTHANTS

NORTHAMPTON Basic Computers & Systems Ltd., 72 Kingsthorpe Hollow. TEL: (0604) 710740

NOTTINGHAMSHIRE

NOTTINGHAM Cameo Computers, 8/9/10 Trinity Walk. TEL: (0602) 742912
NOTTINGHAM Basic, 39-41 Trent Boulevard, West Bridgeford. TEL: (0602) 819713
WORKSOP Compulagrafix, Bridge St. TEL: (0909) 472248

NORTHERN IRELAND

BELFAST Arthur Hobson Ltd., 37 Gt. Victoria St. TEL: (0232) 246336
LONDONDERRY Foyle Computer Systems, 3 Bishop St. TEL: (0504) 268337

OXFORDSHIRE

ABINGDON Ivor Fields Computers, 21 Stert St. TEL: (0235) 21207
BANBURY Computer Plus, 2 Church Lane. TEL: (0295) 55890
HENLEY ON THAMES Family Computers Ltd., 40A Bell St. TEL: (0491) 575744
OXFORD Ivor Fields, 7 St. Ebbes St. TEL: (0235) 21207

SCOTLAND

ABERDEEN North East Computers, 1-3 Ellis St., Peterhead. TEL: (0779) 79900
AYR Vennals, 6a New Bridge St. TEL: (0292) 264124
DUMFRIES Vennals, 71 English St. TEL: (0387) 4547
EDINBURGH The Silicon Centre, 6-7 Antigua St. TEL: (031) 557 4546
GLASGOW Victor Morris Ltd., 340 Argyle St. TEL: (041) 221 8958
HAMILTON Tom Dickson Computers, 8-12 Cadzow St. TEL: (0698) 283193
KILMARNOCK Vennals, 49 Foregate. TEL: (0563) 32175
KIRKCALDY Kirkcaldy Photographic Services, 254E High St., Fife. TEL: (0592) 204734
STIRLING R. Kilpatrick, 58 Port St. TEL: (0786) 5532

SHROPSHIRE

SHREWSBURY Computerama, 13 Castlegate. TEL: TBA

SOMERSET

TAUNTON Grays, 1 St. James St. TEL: (0823) 72986

STAFFORDSHIRE

STAFFORD, Computerama, 59 Forgate St. TEL: (0785) 41899
STOKE-ON-TRENT Computerama, 11 Market Sq., Arcade, Hanley. TEL: (0782) 268620

SUFFOLK

BURY ST. EDMUNDS Bury Computer Centre, 11 Guildhall St. TEL: (0284) 705772
FELIXSTOWE K. M. Communications Ltd., 4 Manning Rd. TEL: (0394) 271113 or 273459
IPSWICH Brainwave, 24 Crown St. TEL: (0473) 50965
LOWESTOFT John Wells, 44 London Rd., North. TEL: (0502) 3742

SURREY

CAMBERLEY Camera Arts (Micro Computer Division), 36 High St. TEL: (0276) 65848
CHERTSEY Chertsey Computer Centre, 1 Windsor St. TEL: (09328) 64663
CROYDON Cadcom Ltd., 96 Whitgift Centre (Next door to MacDonald's) TEL: (01) 686 8393
GUILDFORD The Model Shop, 23 Swan Lane. TEL: (00772) 0483 39115
HASLEMERE Haslemere Computers, 25 Junction Place, adj. Rex Cinema. TEL (0428) 54428
NEW MALDEN Surrey Micro Systems, 31 High St. TEL: (01) 942 0478
WALLINGTON Surrey Micro Systems Ltd., 53 Woodcote Rd. TEL: (01) 647 5636
WOKING Harpers, 71/73 Commercial Way. TEL: (04862) 25657

SUSSEX

BEXHILL-ON-SEA Computerware, 22 St Leonards Rd. TEL: 0424 223340 (Opening Mid-October)
LITTLEHAMPTON Alan Chase Ltd., 39 High St. TEL: (09064) 5674/4545

TYNE & WEAR

NEWCASTLE-ON-TYNE Newcastle Camera & Computer Mart, 16 Northumberland Ct. TEL: (0632) 327461

WALES

ABERDARE Inkey Computer Services Ltd. 70 Mill St., The Square, Trecynon, TEL: (0685) 881828
ABERYSTWYTH AberData at Galloways, 23 Pier St. TEL: (0970) 615522
CARDIFF Randall Cox, 18/22 High St. Arcade. TEL: (0222) 31960
NEWPORT (Gwent) Randall Cox, 118 Commercial St. TEL: (0633) 67378
PEMBROKE Randall Cox, 19 Main St. TEL: (064) 668 2876
PORT TALBOT Micro Gen, 6 Royal Buildings, Talbot Rd. TEL: (0639) 887730
WREXHAM T E Roberts, 26 King St. TEL: (0978) 364404/364527

WARWICKSHIRE

LEAMINGTON SPA IC Computers, 43 Russell St. TEL: (0926) 36244
RUGBY The Rugby Micro Centre. 9-11 Regent St. TEL: (0788) 70522

WEST MIDLANDS

BIRMINGHAM Sherwoods, Gt. Western Arcade. TEL: (021) 236 7211
COVENTRY Coventry Micro Centre, 33 Far Gosford St. TEL: (0203) 58942
DUDLEY Computer World, 35 Churchill Precinct. TEL: 0384-238169
ERDINGTON The Gamekeeper Grand Fare, High St. TEL: (021) 3846108
WEST BROMWICH Bett & Jones, 39 Queens Sq. TEL: (021) 553 0820

WILTSHIRE

SALISBURY Whymark Computer Centre, 20 Milford St. TEL: 0722 26688

WORCESTER

WORCESTER David Waring Ltd., 1 Marmion House, High St. TEL: (0905) 27551

YORKSHIRE

BRADFORD Erricks Foto-Sonic House, Rawson Sq. TEL: (0274) 309266
HUDDERSFIELD Richards (formerly Lauries) 12 Queen St. TEL: (0484) 25334
HULL The Computer Centre (Humberside) Ltd., 26 Anlaby Rd. TEL: (0482) 26297
LEEDS Bass & Bligh, 4 Lower Briggate. TEL: (0532) 454451
SHEFFIELD Superior Systems Ltd., 178 West St. TEL: (0742) 755005
SKIPTON Look & See, 45 Belmont Bridge. TEL: 0756 60078
YORK York Computer Centre, 7 Stonegate Arcade. TEL: (0904) 641862

Not all stores carry every advertised item - please 'phone before making a journey. Prices correct at time of going to press. E.& O.E.

Unlock Your Imagination

...with SCOPE Computer Graphics Language and write arcade-style game programs to compete with the professionals.

THIS sensational SCOPE utility and your Spectrum will unlock your imagination. It's amazingly simple and fast and enables you to write fast-moving games in MACHINE CODE.

SCOPE realises your potential and releases it. You'll amaze family and friends and surprise the professionals *They said it couldn't be done.*

TECHNICAL DETAILS

SCOPE is a fully structured multitask compiled language, specifically for writing arcade-type games enabling you to program machine code without any knowledge of machine code.

SCOPE can be used as an assembler with SCOPE words as plain language mnemonics, therefore no knowledge of machine code is required.

Each command word will write into the program memory the relevant machine code.

It is generated from BASIC and is fully compatible with BASIC.

The language from the user end is very easy to comprehend and is comprehensive, providing many features not available from BASIC. SCOPE has to be used to be believed.

- ☐ *As fast as MACHINE CODE*
- ☐ *Simpler than BASIC*
- ☐ *Instruction Manual*
- ☐ *£11·95*

48K SPECTRUM

SCOPE
Computer Graphics Language

CLIP THE COUPON NOW AND UNLOCK YOUR IMAGINATION

Post to: ISP Marketing Ltd, Crown House, 38b High Street, Godalming, Surrey
Tel: Godalming (04868) 24151 Money refunded if not satisfied and tape returned within 7 days. Please rush me .... copies of the SCOPE computer graphics language tape and instruction manual at £11.95 (p&p free). (Cheques payable to ISP Marketing Ltd)

Block capitals please

Name ______________________

Address ______________________

Dealer Enquiries Welcome

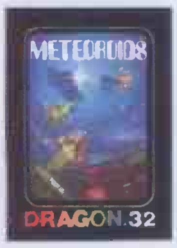
C.

At Dragon we design our software to keep one step ahead of you.

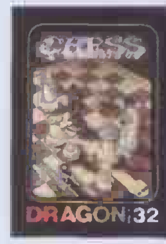
Take Doodlebug* for example. With six bugs on your side you may think the game is merely tough to cope with.

But then you should try it with only five. Then four. Then three. The game grows more difficult as your skill grows. Of course Doodlebug isn't the only one to do this.

There's also Meteoroids† with sixteen levels of difficulty and several modes of play, to test your capabilities as a space pilot.



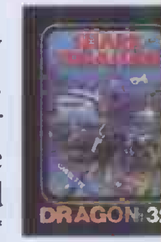
And our Chess program has nine levels from difficult to downright impossible. Just right for every budding Boris Spassky.



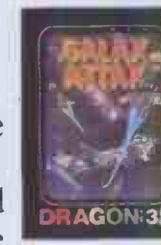
Shuttlezap,* on the other hand, is one of our more complicated arcade-type games. Complete with in-flight reports, and navigational briefings, Shuttlezap will even talk to you.

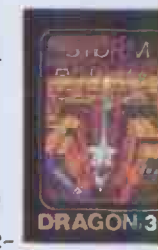
Whirlybird Run* is a bit more down to earth. But only a bit. You are the pilot of a helicopter over alien territory and then through caverns and then, well, try it yourself and see.

Or, to go lower still, dive below the sea to recover gold in Shark Treasure.* It's a bit like 'Jaws' - the only trouble is there's up to six sharks after you.

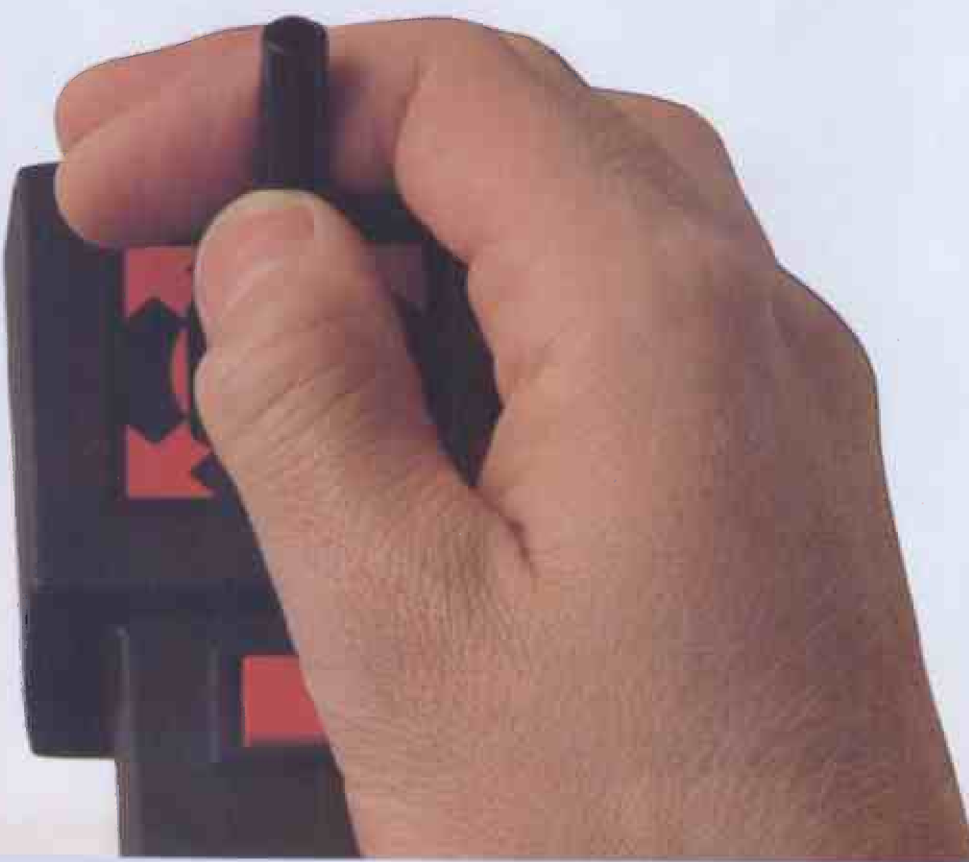


Back in space with Galax Attax.* In this you defend your ground base against alien intruders, but you can never win, they just keep on coming. In Storm Arrows* you are pitted against (surprise, surprise) arrows. But be care-





Once you've mastered Doodlebug try a more difficult game.



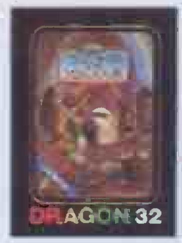
ful not to run out of fuel - just like real life. While in Cosmic Invaders† all you have to do is save the universe (without leaving your own front room).

And, if you actually enjoy driving yourself mad, then try Berserk* for starters. You could end up looking like the man on the pack front, if the robots don't get you first.

Or even spend some time in a maze. Unfortunately in Ghost Attack* you have company in the form of some particularly single-minded ghosts whose sole aim in life is to eat you.

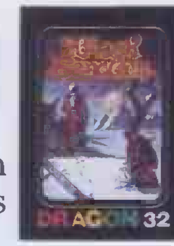
Then there are a number of adventure games, none of which can be considered easy, and which can only be played on a real computer.

In Madness and the Minotaur, you descend into the labyrinth of King Minos (but watch out for the monsters that dwell there).



While in Quest you command medieval forces to overcome a whole host of enemies. Just the thing for the power mad amongst you.

And Black Sanctum involves overcoming the forces of black magic. It starts in the frozen wastes of the north and ends who knows where.



These are just a few of our expanding software range. New titles are added each month, and, while some may be rather difficult, rest assured that using the Dragon could hardly be more simple. Even the handbook is written in everyday English, not some kind of obscure computer language.

So if you can read, you can master the Dragon.

But you can't beat it.

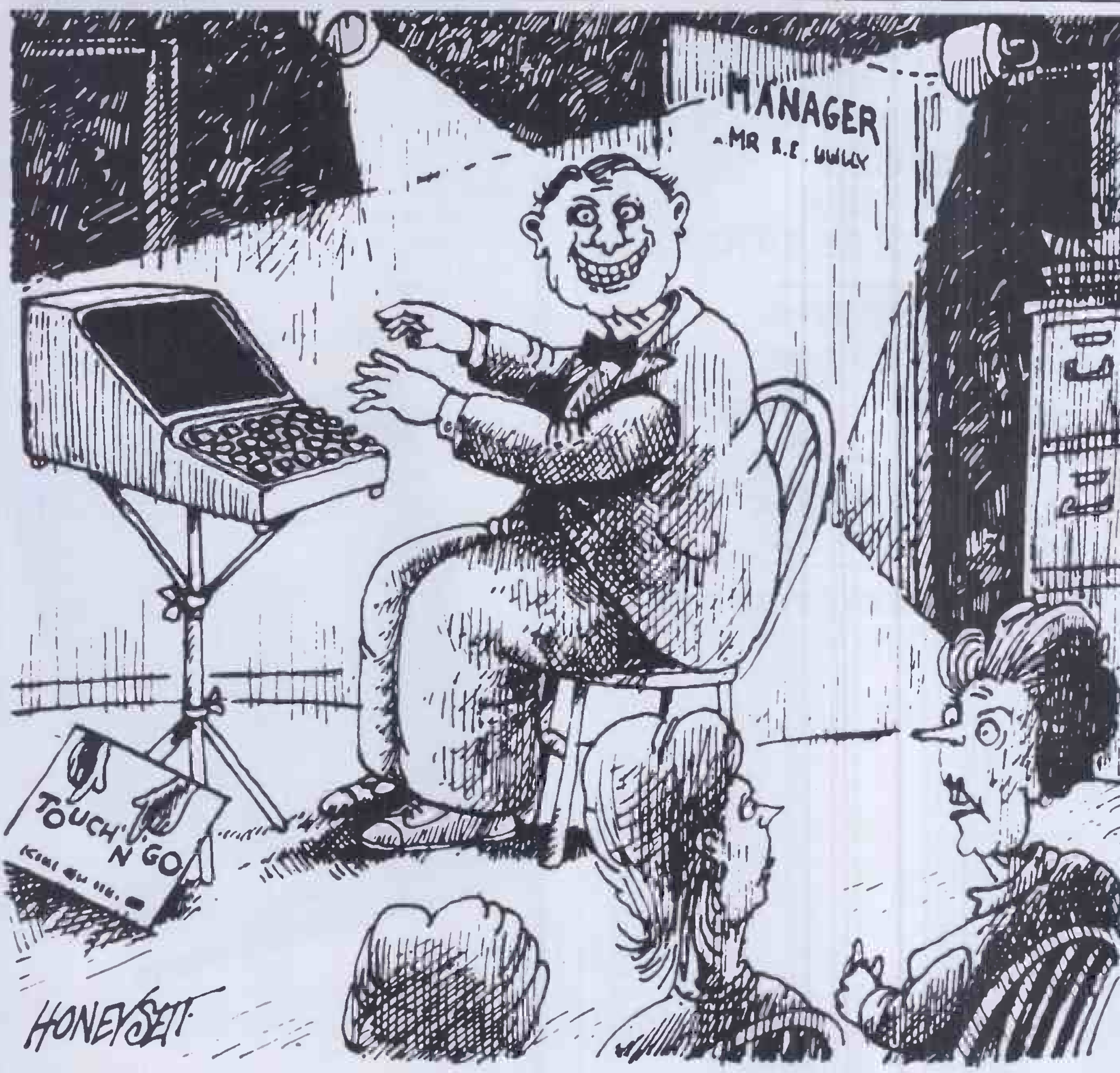
DRAGON 32

The first family computer.

Like Doodlebug for instance.

See us at the Barbican Centre, on Stand No. 121.

*Joystick required.
†Joystick optional.



"This is the bit where he gives it all ten fingers!"

Is your high-performance computer let down by your low-performance fingers? Touch 'n' Go will change all that. In just 24 hours you can master the computer's QWERTY keyboard and its numeric keypad. Forget boring drills and meaningless hieroglyphics, Touch 'n' Go introduces real words and phrases at the earliest possible moment. The computer gives you instant feedback on your performance and can even store the results for posterity. By the end of the course you should be capable of 40 words per minute.

Why use two fingers when you have ten?

Touch 'n' Go is available from computer dealers and direct from Caxton for only **£25** plus VAT.
It is available in popular CP/M and MSDOS formats.
Please add £1 p&p when ordering direct.

Caxton

Caxton Software Ltd 10-14 Bedford Street, Covent Garden, London WC2E 9HE

Timpro

Personal Computer Desk

Whether you are a busy executive who works mainly from home or a dedicated enthusiast, it probably didn't take too long to realise that the dining table or sideboard is a far from ideal home for your computer. The answer like most good ideas, is simple: The Timpro Personal Computer Desk.

Dimensions – 33"high; 25" Deep; 36"Wide.

Attractive Teak Effect Finish and Advanced Concealed Fastening System.

Steel Legs Attractively Finished in Durable Brown Epoxy Resin For Strength And Stability.

Cable Management By Ties And Two Way 13amp Plug Bank As Standard.

- **Houses most popular micros, e.g. Sharp MZ 80A**
- **Rigid assembly in minutes with full instructions provided.**
- **Trade Tested and Approved.**
- **Dealer Enquiries Welcomed.**
- **Can be supplied with cut out to accomodate built-in screens e.g. Sharp MZ 80A**

Cheque/postal order payable to:
TIMPRO MANUFACTURING COMPANY
Poulton Industrial Estate, Poulton-le-Fylde, Blackpool FY6 8JU
For £59.95 + VAT and £5.75 carriage.

NAME ....

ADDRESS ....

....

....

Allow 21 days for delivery

ADMAN ELECTRONICS

Add on the Adman way

The Vic 20 really can speak...but only if you use an ADMAN SPEECH SYNTHESISER It's word power is endless as there is no set vocabulary. Yet operation is simple. The 64 elements of English speech are pre-programmed to let you put your own words together as soon as you switch on. Just imagine...program adventure games with characters that can actually talk!

Also for your Vic 20 there are 8K and 16K RAM PACKS and the ADMAN 3 PORT EXPANSION MOTHER BOARD. With proven designs of the highest quality they are the best value for money around.

The Vic 20 speaks out!

Available from Spectrum, Dixons and other major computer accessory shops

Prices around:

8k Ram Pack	£39.95
16k Ram Pack.	£49.95
Motherboard.	£19.95
Speech Synthesiser . .	£49.95

To find out more about these products, why not take a lead from our speech synthesiser...go to your local dealer and ask for it! Or post the coupon.

Dept. C, Adman Electronics Ltd., Ripon Way, Harrogate, N. Yorks HG1 2AU. Tel: 0423 62642

Please send me information on Adman Vic 20 Accessories

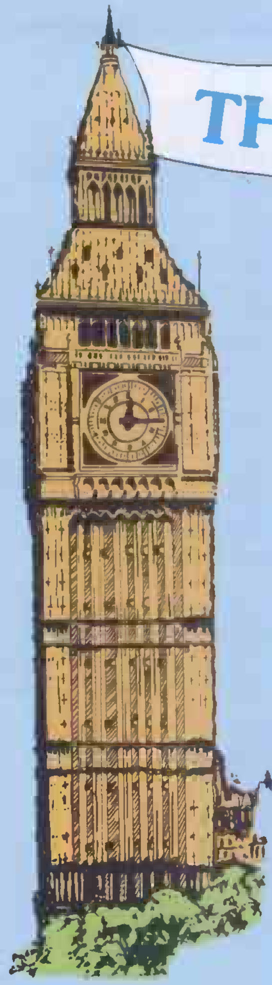
Name ________________________

Address ______________________

____

PCW 9/83

Adman Electronics Ltd. is a member of the Adam Leisure Group PLC



THE BBC MICRO USER SHOW

The show that attracted record attendances in Manchester and Nottingham now comes to the heart of London – with a fabulous pre-Christmas bonanza of all that's best for the BBC Micro. There are lots more exhibitors, who will be using the show as a launching-pad for the very latest software, plus many hardware devices that are rapidly making the BBC Micro one of the most versatile computers of them all.

Westminster Exhibition Centre

(formerly the Royal Horticultural Halls)

Greycoat Street, London SW1

Thursday to Sunday, December 8 to 11

Organised by Database Publications

Exhibitors include: Acorn Computers, Akhter Instruments, Advanced Memory Systems, BBC Telesoftware, Bradford Office Supplies, Computersolve, CJE Microcomputers, C-Tech, CWP, Clwyd Technic, Clares Micro Supplies, Cumana, Commotion, Deskflair, Eltec Computers, Electronequip, Educational Software, Glengary Soft, Golem, Kirklands Computers, Kansas City Systems, LCL, Lowland Designs, Logic Sales, Micro Aid, Micro Power, Master Class, Microvitec, MW Systems, Miniature Tool Co., Opus Supplies, Oakleaf Computers, Proteus Computers, Pace Software Supplies, RH Electronics, Superior Software, System, TABS, Viglen Computers Services.

★ ASK the experts – free advice on all aspects of computing from people who know the BBC Micro inside out.

★ CALL in to one of our highly successful walk-in seminars, at which all the famous names from the world of BBC Micro computing will be taking part. Whatever your interest – graphics, machine code, interfacing, education – there will be a top expert speaking on it. *(Saturday and Sunday only)*

★ TRY OUT for yourself the games that will be the top sellers this Christmas – and well into next year.

★ FIND out about all the new peripherals for the BBC Micro – disc drives, interfaces, ROM boards, robots and second processors.

★ DISCOVER why the Electron – the baby brother of the BBC Micro – has been hitting the headlines and why all the experts are tipping it to be the big seller of 1984.

Each of these vouchers saves £1 off the normal adult admission price. Children's tickets: £1.

£1 ***off normal exhibition admission price of £3***

The BBC Micro User Show

10am - 6pm, Thursday, December 8
10am - 6pm, Friday, December 9
10am - 6pm, Saturday, December 10
10am - 4pm, Sunday, December 11

Westminster Exhibition Centre, Greycoat Street, London SW1.

£1 ***off normal exhibition admission price of £3***

The BBC Micro User Show

10am - 6pm, Thursday, December 8
10am - 6pm, Friday, December 9
10am - 6pm, Saturday, December 10
10am - 4pm, Sunday, December 11

Westminster Exhibition Centre, Greycoat Street, London SW1.

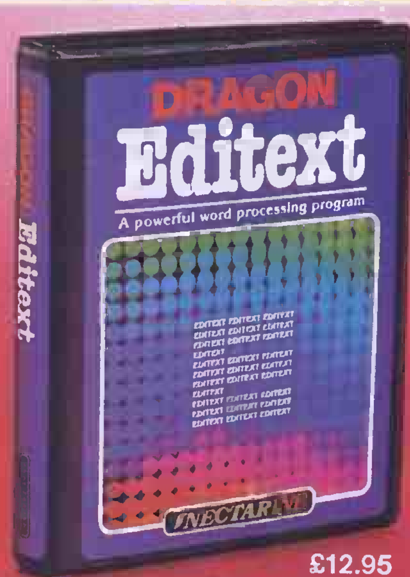
State of The Art

Our pledge to you
NEVER LESS THAN THE BEST VALUE FOR MONEY

A powerful word processor for your Dragon. With it, two-finger typists can produce error free, well produced letters and documents. Even multiple top copies at the touch of a button. Editext will even correct a mis-spelling for you, right the way through the text!

Features:
- Capitals and small letters
- Automatic word wrap
- Replace words throughout
- Insert, delete or change characters
- Add, delete or move lines blocks
- Adjust line width print
- Justify text on left and right
- Adjust margins
- Produce draft print-out
- Save and load text to/from cassette

A really simple but professional word processing program

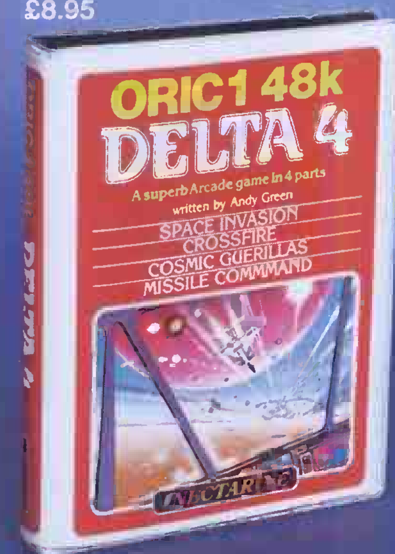


£12.95

SUITABLE FOR DISC AND CASSETTE

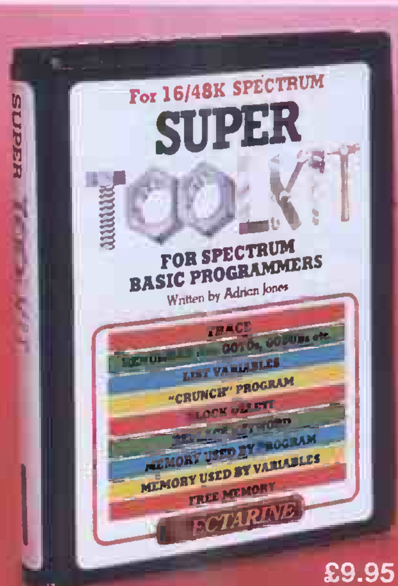
A set of four superb arcade games with truly outstanding graphics and sound. Written entirely in 6502 machine code, it works on any 48K Oric, regardless of whether your computer is fitted with the original Eproms or later issue Roms.

£8.95



The four games are:
Space Invasion, Cross Fire, Cosmic Guerillas, Missile Command.

As the speed and accuracy of your responses improves, each game progresses to increasing levels of difficulty. There are eight levels of difficulty for each game – making 32 in all – sufficient to challenge the most dedicated arcade enthusiast.



£9.95

This is probably the most powerful and useful program available to Basic programmers.
Nine facilities, consuming less than 1K, that monitor, control and correct programs.
What's more it doesn't crash!

RENUMBER
Renumbers your program lines *and* the GOTO/GOSUB's, etc.
TRACE
Displays the operating line numbers as the program runs. UNIQUELY, indicates which statement is being executed in a multi-statement line.
LIST VARIABLES
Lists all variables in a program with their values – strings (even coloured and flashing!).
CRUNCH
Condenses your program. Gives you more memory and improves the running.
BLOCK DELETE
Removes redundant blocks of lines.
REPLACE KEYWORD
Changes any Keyword to another throughout the program.
MEMORY-PROGRAM
Tells you how much memory your program has used.
MEMORY-VARIABLES
Tells you how much memory is being consumed by your variables.
MEMORY-FREE
Tells you how many free bytes remain for use.

Buy Dragon Editext, Oric 1 48k Delta 4 and Spectrum Super Toolkit from W H Smith; Menzies; Boots; Dixons; Websters Bookshops; The Computer Bookshop; and Software Dealers.

For trade terms contact
Nectarine Software
837 Yeovil Road, Slough
Berkshire SL1 4JH
Telephone Slough (0753) 26769

NECTARINE

BBC MODEL 'B' MICRO

UNIQUE OFFER

When you buy a BBC 'B' for £347 from us, we will give you a £50 VOUCHER which can be put towards the cost of an Epsom Printer or 800K Disc Drive, if purchased within 3 months.

£347

The BBC has become the most popular Educational Computer in Britain, not on gimmicks, purely on merit. Comp Shop have the largest stock in the country. A stock of 400 upwards with full engineering support and a full compliment of spares available.

AUTHORISED ACORN DEALER

BBC A to B Upgrade	£80	Speech Upgrade	£55
Disk Upgrade	£90	Econet Upgrade	£60

BBC COMPATABLE DRIVES BY CUMANA

£189 £349

Single 100K	£189	Single 400K	£349
Dual 200K	£349	Dual 800K	£549

All with own Power Supply
BBC Drives also available

TORCH COMPUTERS Z80 DISC PACK

£749

includes 800K Disc Drives, 64K RAM and Z80 FITTED FREE & WHILE-U-WAIT

COMPSHOP PRICE PROMISE
WE GUARANTEE TO MATCH THE PRICE ON EQUIPMENT OFFERED FROM STOCK THROUGH ANY OTHER SUPPLIER.

RGB COLOUR MONITOR

£249

MADE BY MICROVITEC CUB
HIGHLY RECOMMENDED

APPLE IIe

The NEW Apple

Offers you more features & capabilities. 64K RAM, expandable to 128K. Upper & lower case text. 8 internal slots for expansion.

AUTHORISED APPLE DEALERS

SYSTEM 1

Apple IIe 64K — Disk with controller — 80 Column card — 12" Green screen monitor —

£999

SYSTEM 2

Apple IIe 128K — Disk with controller — 80 Column extended card

£999

SYSTEM 3

Apple IIe 128K — Disk with controller — Additional disk drive — 80 Column extended card

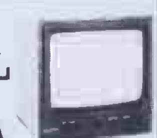
£1199

SYSTEM 4

Apple IIe 128K — Disk with controller — Additional disk drive — 80 Column Extended card — 12" Green screen monitor — Printer interface card — Olivetti Daisywheel printer/Epson FX80 Matrix printer — Applewriter IIe software

£1699

HITACHI PROFESSIONAL MONITORS



9" ~~£129~~ £99.95
12" ~~£199~~ £149

COMPSHOP WAS ESTABLISHED IN 1978 AND HAS CONTINUALLY OFFERED THE BEST IN MICRO COMPUTERS TO DISCERNING CUSTOMERS. WE SELL ONLY COMPUTERS AND PERIPHERALS, AND THEREFORE CAN OFFER THE SUPPORT MANY OTHER SHOPS CANNOT.

INSTANT CREDIT AVAILABLE UP TO £1,000

EPSON FX80 PRINTER

£379

THE WORLD'S MOST POPULAR MATRIX PRINTER

Elite, italic, enlarge & condensed character styles, 160 CPS, proportional spacing, bi-directional, user defined graphics, Hi-res graphics, Superscript & subscript

OLIVETTI DAISYWHEEL PRINTERS

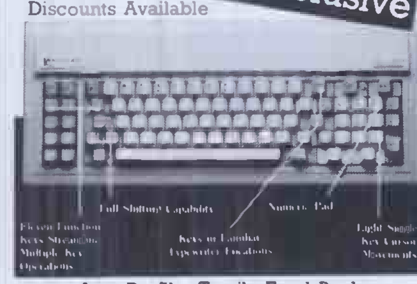
From £329

Low cost daisywheel printer/typewriter — changeable daisywheels. Centronics compatible interface fitted internally. Lift off correction ribbon fitted. Portable — carrying case supplied

KEYTRONIC IBM COMPATABLE

Comp Shop Exclusive £149

Quantity Discounts Available



Low Profile, Tactile Feed Back, Microprocessor Controlled, Solid State Capacitance Switches, IBM Compatable Keyboard complete with Specification Sheet and Coil Connecting Cable.

AS USED ON MAY IBM LOOK-ALIKE COMPUTERS

ALSO STOCKED

OKI Microline Printer, Software, UHF Modulators, Diskettes, Cassettes, Ribbons, Books, Printer Paper, Cables, Connectors and Spare Parts for all makes of computers. Computer Desks.

COMP SHOP LTD

FULL AND FAST REPAIR SERVICE AT YOUR DISPOSAL
EDUCATIONAL ENQUIRIES AND ORDERS WELCOME.
QUOTATIONS GIVEN.
ONE YEAR WARRANTY ON ALL PRODUCTS

All prices quoted are exclusive of VAT. Delivery is added at cost. Please make cheques and postal orders payable to COMP SHOP LTD., or phone your order quoting BARCLAYCARD, ACCESS, DINERS CLUB or AMERICAN EXPRESS number.

BARCLAYCARD VISA — We welcome Access — AMERICAN EXPRESS — DINERS CLUB INTERNATIONAL

TELEPHONE SALES
OPEN 24 hrs. 7 days a week
01-449 6596

14 Station Road, New Barnet, Hertfordshire, EN5 1QW
(Close to New Barnet BR Station - Moorgate Line)
Telephone: 01-441 2922 (Sales) 01-449 6596
Telex: 298755 TELCOM G
OPEN (BARNET) - 10am - 7pm - Monday to Saturday

TWO NEW COMPUTERS FROM NEC

the ADVANCED Personal Computer (APC) for only £1985 + vat:-

Standard features:-

* **SPEED:** Full 5 MHz 8086 16 bit processor (true 16 bit data).
* **CAPACITY:** TWO MEGABYTE professional standard 8 inch disks.
* **MEMORY:** 128k user RAM + screen RAM + system ROM + battery-backed CMOS non-volatile RAM & clock/calendar.
* **OPERATING SYSTEM:** Standard CPM-86, (MSDOS & UCSD soon).
* **HIGH RESOLUTION:** 8x19 dot character screen definition, (25 lines of 80 characters + 26th system status line).
* **AWARD WINNING** NEC 7220 graphic chip in character mode. 256 standard character set includes maths/greek symbols. ADDITIONAL 256 USER-PROGRAMMABLE shape character set(s).
* **KEYBOARD:** Fast 61 key + 25 key numeric/cursor pad + 22 dual mode function keys with labelling facility (16 of which will each hold two 15 character user-defined strings).
* **SERIAL RS-232:** to 19,200 baud synch/asynch. **PARALLEL** Printer.
* **SUPERB MANUALS:** operating level to full technical spec.
* **COMPACTNESS:** 19 inches wide, 24 inches deep, 14 inches high.
* **PRICE:** unbelievable for the quality of this product from the minicomputer division of NEC.

Optional Extra features:-

* **EXPANDABLE USER MEMORY:** in 128k units to 640k RAM.
* **HARD DISKS:** one or two shortly (9 or 18 MB formatted).
* **8 COLOUR SCREEN** (Benchmark & Masterplanner use colour).
* **VERY HIGH RESOLUTION GRAPHICS:** 640 x 475 x 8 colour screen from 1024 x 1024 x 3 bit-mapped array (384k Ram!). Hardware draw, pan & zoom using 2nd NEC 7220 controller. Fast! Macro shape generation etc with CPM-86 GSX/GSS software.
* **32 BIT HARDWARE ARITHMETIC PROCESSOR:** 25 times CPU speed.

Software:-

ACCOUNTS: Own bespoke packages or SYSTEMATICS standard.
WORD PROCESSING: NEC Benchmark, Spellbinder, Wordstar.
DATABASE: DBASE II, MDBS III, Perfect Filer, Rescue.
FINANCIAL PLANNERS: Masterplanner, Supercalc.
LANGUAGES: C, CB86, CBASIC 86, Cobol, Fortran, Pascal, PL/1.
COMMUNICATIONS: IBM Asynch, Bisync 3780, 3270, HASP.

the NEC PC-8800 series:-

Keyboard & CPU

* **STANDARD:** 4 MHz Z80A processor, CPM-80 compatible.
* **MEMORY:** 64k user RAM + 48k screen graphic RAM + 72k ROM.
* **BASIC LANGUAGE:** in ROM, 2 versions of Microsoft:-
  N-BASIC: compatible with PC-8001, V4.5 + block graphics.
  N88-BASIC: V5 with 40 character variable names, 640x200 8 colour (or brightness) full bit-mapped graphics, or 640x400 one colour/brightness bit-mapped (for high-speed 14 inch monitors), or 3 screens of 640x200 one colour. Very impressive user-defined shading, colour mixing and patterning for auto fill of shapes under paint command. Scaling, 2000x2000 virtual co-ordinate system. Named Subroutine calls. Machine code monitor assembles/disassembles/debugs. Direct access disk I/O commands. (EX-DIRECTORY).
  45k RAM for program and variables call subroutines by name.
  CHAIN MERGE/DELETE/COMMON.
* **CASSETTE INTERFACE:** 600 & 1200 baud.
* **CHARACTER SCREEN:** independent of graphic memory (will superimpose on screen), 40/80 columns, 20/25 lines, optional function key display on 25th line. Full NEC character set including maths/greek symbols.
* **KEYBOARD:** Fast 67 key + 20 key numeric pad + 5 dual mode function keys holding 15 character text/control strings.
* **SERIAL RS-232:** 75 to 9600 baud. PARALLEL printer output. Inbuilt TERMINAL MODE.
* **EXPANSION SLOTS:** four. Bus is PC-8012 compatible.
* **BATTERY BACKED** clock/calendar.

...ALL FOR £682

Optional Extras:-

* **Intel 8088 processor card for dual standard (shortly).**
* **5 inch floppy disk drives (320k each): up to 4**
* **8 inch floppy disk drives (1MB each): up to 4**
  Note: up to 8 disk drives may be run, mixed 5 and 8 inch)
* **RAM "disk": 128k (shortly) for ultra-fast access.**
* Choice of 12 inch (normal 200 dot line) and 14 inch (high speed 400 dot line) monochrome and colour monitors.
* Light Pen * Dedicated dot matrix printer. **Will dump screen graphics.**

Software:-

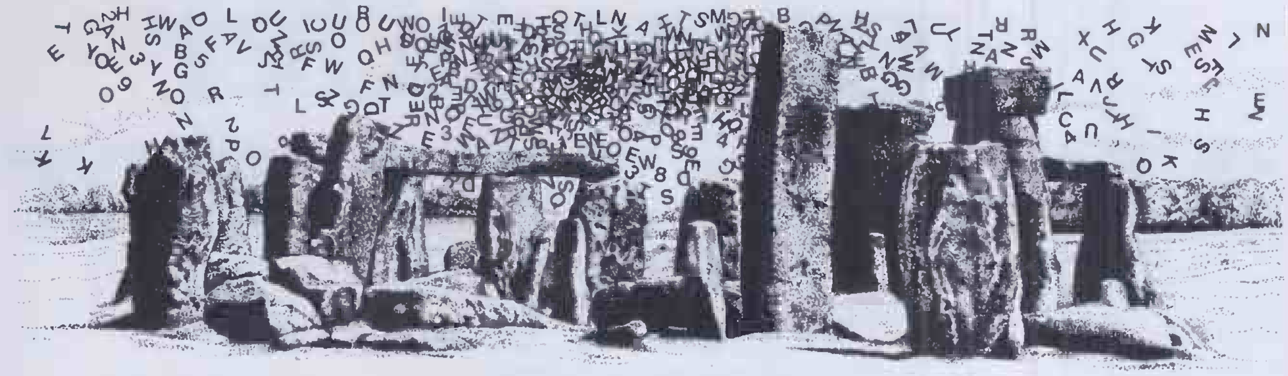
* **CPM 2.2, supporting a vast amount of software.**
* **Utilities for a variety of CPM disk formats.**
* **BESPOKE SOFTWARE TO ORDER by ourselves often at package prices.**

Brighton Computer Centre

130 Lewes Road, Brighton BN2 3LG. (0273) 673114 Mon-Sat 10am-6pm

Please send me further details of the NEC APC.
Name ....
Company ....
Address ....
.... Tel..........
Application WM11/83

Please send me further details of the NEC PC-8800
Name ....
Company ....
Address ....
.... Tel..........
Application WM11/83



LEAVE THE STONE AGE BEHIND!

MACHINE LANGUAGE
BUSINESS SOFTWARE

SYSTEM II

FOR TRS-80 MODEL III

FAST - NO FILE HANDLING! **FULLY INTEGRATED!**

STOCK CONTROL	AVAILABLE NOW
SALES LEDGER*	AVAILABLE NOW
PURCHASE LEDGER	AVAILABLE 31/10/83
NOMINAL LEDGER	AVAILABLE 30/11/83

* INCLUDES INVOICING AND STATEMENTS

"STATE OF THE ART SOFTWARE"

DESCRIPTIVE BROCHURE ON REQUEST FROM:

TEL: [0424] 220391/223636

TELEX 86736 SOTEX G

MOLIMERX™ LTD

A J HARDING (MOLIMERX)

1 BUCKHURST ROAD, TOWN HALL SQUARE, BEXHILL-ON-SEA, EAST SUSSEX.

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 plus £1 postage.

sinclair special

5

Inside...
New Interface 2 and ROM cartridges!
New Software!

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software. Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX® assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

You may well have heard news of ZX Interface 2® and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager

SOFTWARE UPDATE

The latest cassette software for ZX® Compute

Chess Tutor 1
For 48K RAM Spectrum. **£9.95.**

Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.®

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics – pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer – with demonstra tions and hints from your ZX Spectrum when you want them.

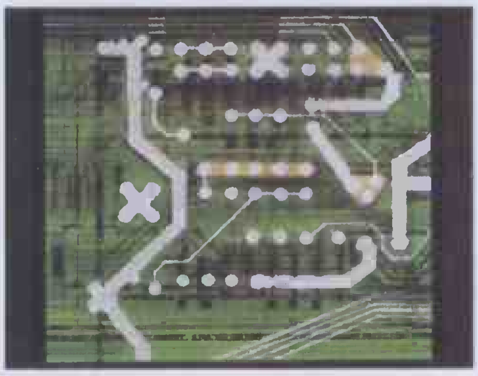
You can choose which parts of the course you want – and even experienced players ma be surprised at what they can learn from Chess Tutor.

Musicmaster
For 48K RAM Spectrum. **£9.95.**

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signature durations of notes, and scales.

You can write your own tunes – in any key – play them over and over again, save them on tape, modify them.

You can either write your music on a stave, or place a simple overlay on your Spectrum fo a 17-note keyboard.



Make-a-Chip
For 48K RAM Spectrum. **£9.95.**

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

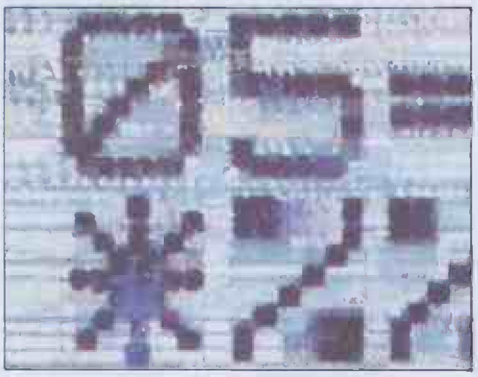
When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

Make-a-Chip is a fascinating way of finding out how computer logic works.

Print Utilities
For 16K and 48K RAM Spectrum. **£9.95.**

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



Beyond BASIC
For 48K RAM Spectrum. **£9.95.**

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs – then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

ZX INTERFACE 2®

The New ROM Cartridge/Joystick Interface

Loads programs instantly!
Takes two joysticks!
Just plug-in and play!

SEE BACK PAGE FOR ZX INTERFACE 2 AND ROM CARTRIDGE ORDER FORM!

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!

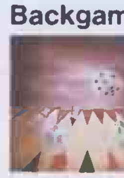
...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

Backgammon



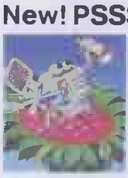
Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

Space Raiders

Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

New! PSSST



Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

Chess

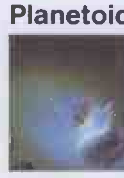
This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chessboard and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

Planetoids



Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Hungry Horace

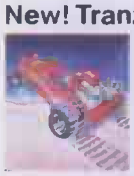
Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am



Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders

Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

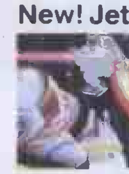
New! Cookie

You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

New! Jet Pac



As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.

ZX MICRODRIVE

NOW ON RELEASE

The ZX Microdrive® System – as you'd expect from Sinclair – is unique to the world of computing. It's a compact, expandable add-on system which provides high-speed access to massive data storage. With just one Microdrive alone (and Interface 1), you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in mere seconds, the beginnings of a local area network of up to 64 Spectrums, *and* a built-in RS232 interface! The cost? Less than £50 for each Microdrive.

How to get ZX Microdrive

Spectrum owners who bought direct from us, by mail order, have been sent full details. Order forms are being mailed in strict rotation, so if you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

If you didn't buy your Spectrum by mail order, don't worry. Send us the form from the bottom of this page. We'll add your name to the mailing list, and send you details by return.

Each Microdrive costs £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

How to order

Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course. Please allow 28 days for delivery.

®ZX, ZX Spectrum, ZX Interface and ZX Microdrive are all registered trade marks of Sinclair Research Ltd.

sinclair®

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

ORDER FORM

Section A: Hardware

Qty	Item	Code	Item Price £	Total £
	ZX Interface 2	8501	19.95	
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			TOTAL £	

Section B: Software **ROM CARTRIDGE PROGRAMS**

	G12/R Planetoids	5302	14.95	
	G9/R Space Raiders	5300	14.95	
	G13/R Hungry Horace	5303	14.95	
	G24/R Horace and the Spiders	5305	14.95	
	G28/R PSSST	5307	14.95	
	G30/R Cookie	5309	14.95	
	G29/R Tranz Am	5308	14.95	
	G27/R Jet Pac	5306	14.95	
	G22/R Backgammon	5304	14.95	
	G10/R Chess	5301	14.95	

CASSETTE PROGRAMS for ZX Spectrum

E9/S	Chess Tutor 1	4308	9.95	
E7/S	Musicmaster	4306	9.95	
E8/S	Beyond BASIC	4307	9.95	
E6/S	Make-a-Chip	4305	9.95	
L5/S	Print Utilities	4404	9.95	
			TOTAL £	

*I enclose a cheque/postal order made payable to Sinclair Research Ltd for £

*Please charge to my Access/Barclaycard/Trustcard account no:

*Delete/complete as applicable.

Signature

Mr/Mrs/Miss

Address

PCW 911

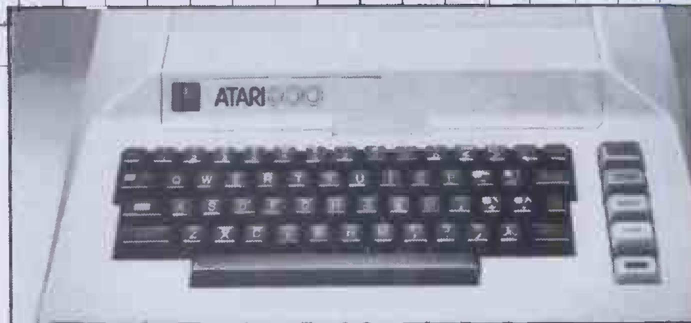
(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, *and* send me a colour brochure with full specifications of ZX Microdrive/Interface 1 ☐ *(tick here)*. You can use the above form to send us your name and address.

LEISUREBASE
NEW NAME IN

Prices correct at time of going to press. Please telephone to verify before making a journey.



ATARI 800
NOW INCORPORATING A BIG 48K RAM: THE 800 IS ONE OF THE MOST FORMIDABLE HOME MICROS ON THE MARKET. FEATURES INCLUDE: 10K ROM; 16 COLOUR GRAPHICS; FOUR INDEPENDENT SOUND VOICES COVERING 3½ OCTAVES; BASIC CARTRIDGE.

LEISUREBASE PRICE **299.99** INC VAT

Introducing Leisurebase — the friendly new name in microcomputers. You'll find us a friendly bunch and we aim to take a lot of the mystique out of buying microcomputers. You'll find our prices competitive and our product range wide. We also make sure we can support you with a comprehensive selection of peripherals and software.

Leisurebase No Deposit Instant Credit

No deposit instant credit is available at your local Leisurebase when you use the budget card. Please call in and ask for written details. We also take Barclaycard Visa and Access. (Leisurebase Credit Brokers APR. 30.6%.)

Part Exchange

If you're looking to upgrade your computer, come to us first as we are often willing to take good quality used equipment in part exchange.

Whichever way you look at it, you'll be better off coming to Leisurebase first.

SINCLAIR ZX SPECTRUM
THE 16K VERSION HAS NOW CRASHED THROUGH THE £100 BARRIER AND BOTH OFFER AMAZING VALUE. FEATURES INCLUDE: 16K BASIC ROM; 8 COLOUR GRAPHICS; 'BEEP' SOUND COMMAND; FULL SIZE KEYBOARD; WIDEST POSSIBLE SOFTWARE CHOICE.

16K – LEISUREBASE PRICE **99.99** INC. VAT

48K – LEISUREBASE PRICE **129.99** INC. VAT

SPECIAL OFFER ON PERIPHERALS

Spectravision Quick Shot Joysticks for Atari and Commodore	11.99
Daytel joystick interface for Spectrum	12.99
Benkson TRC6 Cassette Recorder fits computers with standard jack socket	29.99

LEISUREBASE SOFTWARE

We can't do justice in this ad. to the wide range of software available at Leisurebase stores and the following should be seen as a small selection only.

RABBIT SOFTWARE
For VIC 20
Paratroopers · Anti Matter Splatter · Packacuda · Escape MCP · Quackers · Critters · Cyclons · Race Fun · Myriad · English Invaders · The Catch · ALL AT **5.99**

Annihilator · Night Crawler · Hopper · ALL AT **9.99**

Rabbit Software also available for VIC 64

VIRGIN SOFTWARE
For Spectrum: Yomp · Starfire · Sheepwalk · Golf ·
For VIC20
Mission Mercury
ALL AT **7.99**

IMAGINE SOFTWARE
For Spectrum: Arcadia · Schizoids · Ah Diddums · Molar Maul · Jumping Jack · Z Zoom · Zip Zap · ALL AT **5.50**

For VIC 20: Arcadia · Wacky Waiters · Catcha Snatcha · Frantic · ALL AT **5.50**

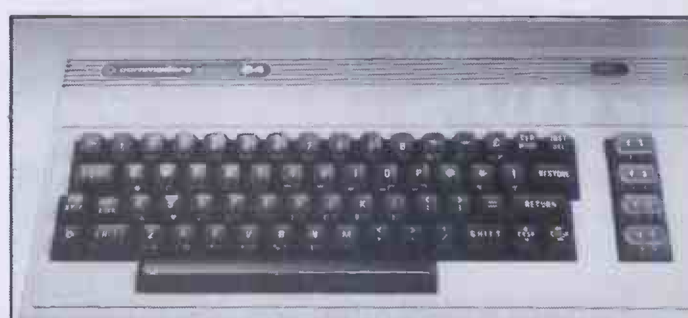
CHANNEL 8 SOFTWARE
For Atari: The Golden Baton · Time Machine · Escape from Pulsar No. 7 · Circus · Arrows of Death Part 1 · Arrows of Death Part 2 · Feasibility Experiement · ALL AT **17.99**

CGL M5
COMPACT, ULTRA RELIABLE INTRODUCTION FROM THE WORLD RENOWNED SORD STABLE. FEATURES INCLUDE: 16K VIDEO RAM EXPANDABLE TO 32K; 8K ROM VIA PLUG-IN CARTRIDGE EXPANDABLE TO 16K; 16 COLOUR GRAPHICS; 6 OCTAVE SOUND SYNTHESIZER.

LEISUREBASE PRICE **149.99** INC. VAT

TEXAS SOFTWARE — NEW LOW PRICES

Video Chess	34.99	Hunt the Wumpus	14.99
Attack	14.99	Blasto	11.99
Tombstone City	14.99	TI Invaders	19.99
Car Wars	19.99	Alpiner	24.99
Munchman	29.99	Chisholm Trail	19.99
Parsec	29.99	Adventure	24.99
Adventure (cass.)	ea. 14.99	Early Learning Fun	14.99
Number Magic	14.99	Addition/Subtraction 1	19.99
Multiplication	19.99	Alligator Mix	24.99
Dragon Mix	24.99	Meteor Multiplication	24.99
Prog. Language extended BASIC	69.99	Mini Memory	69.99

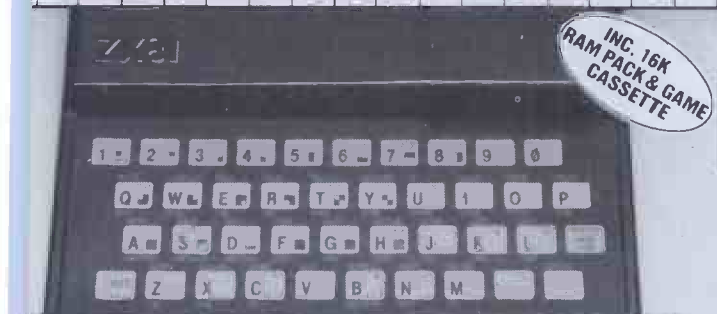


COMMODORE 64
POWERFUL MICRO SUITABLE FOR HOME OR BUSINESS USE. FEATURES INCLUDE: A 64K RAM; FULL SIZE KEYBOARD; 16 COLOUR HIGH RESOLUTION GRAPHICS; SPECIAL 3-D EFFECT GRAPHIC CAPABILITY; MUSIC SYNTHESIZER.

LEISUREBASE PRICE **199.99** INC. VAT

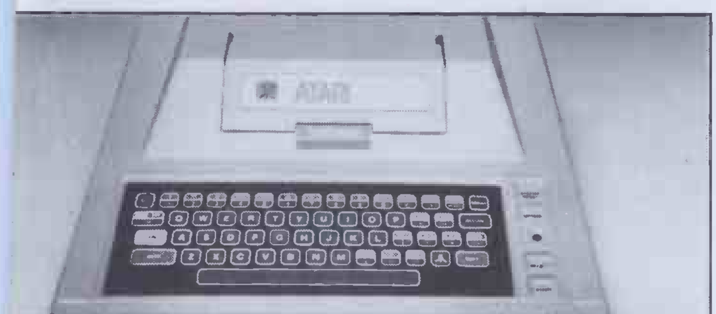
THE FRIENDLY COMPUTERS

ATTENTION ALL DEALERS
For details of Britain's newest & brightest Computer Franchise Group contact Erica Woodhouse on 0279 58371 or write in strictest confidence to: Leisurebase, Unit 9, Raynham Road Industrial Estate, Bishops Stortford, Herts. Each new dealer will be allotted an exclusive territory & we urge you to contact us now!



SINCLAIR ZX81
FAR AND AWAY THE WORLD'S BIGGEST SELLING HOME MICRO AND THE MODEL THAT'S INTRODUCED COMPUTING TO A WHOLE GENERATION. FEATURES INCLUDE 8K ROM: 1K RAM EXPANDABLE TO 16K; INGENIOUS FLAT FACE KEYBOARD: MASSIVE RANGE OF COMPATIBLE PERIPHERALS AND SOFTWARE

LEISUREBASE PRICE **44.99** INC. VAT



ATARI 400
THE PERFECT INTRODUCTION TO HOME COMPUTING IN A CONCISE LOGICAL PACKAGE. FEATURES INCLUDE: 16K RAM; 16 COLOUR GRAPHICS; FOUR INDIVIDUAL VOICE SOUND CAPABILITY COVERING 3½ OCTAVES; 'WIPE CLEAN' PRESSURE SENSITIVE KEYBOARD; BASIC CARTRIDGE.

LEISUREBASE PRICE **149.99** INC. VAT

VIC 20 COMPLETE STARTER PACK
A COMPLETE COMPUTER SYSTEM IN ONE BOX BASED ON THE LEGENDARY VIC 20. PACK ALSO INCLUDES A CASSETTE UNIT, A SIMPLE EXPLANATION OF COMPUTER PROGRAMMING, INTRODUCTION TO BASIC PART 1 AND AN EXCLUSIVE COMPILATION TAPE OF 4 COMPUTER PROGRAMS — BLITZ, TYPE-A-TUNE, RACE AND HOPPIT

LEISUREBASE PRICE **134.99** INC. VAT

TEXAS TI 99/4A
SUPER 'USER FRIENDLY' MICRO THAT IS SIMPLE TO USE AND IS EXPANDABLE AS YOUR INTEREST GROWS. FEATURES INCLUDE: INTERNAL 26K ROM MEMORY; 16K RAM EXPANDABLE TO 48K; CONTROLLABLE 5 OCTAVE 3 SIMULTANEOUS TONE SOUND, PLUS NOISE GENERATOR; 16 COLOUR GRAPHICS.

LEISUREBASE PRICE **99.99** INC. VAT

YOUR LOCAL LEISUREBASE DEALER

BASILDON
Godfrey Photographic
4-5 Laindon Main Centre, Laindon
Tel: 0268 416747

BELFAST
AJM Studios
337 Newtownards Rd
Tel: 0232 59710
Cl. Wed.

BELPER
Opening Soon
Harrison Computer Supplies
3 Chapel St
Tel: 0773 820202

BIRMINGHAM
Leisurebase
28 South Mall
Birmingham Shopping Centre (Next to Asda)
Tel: 021 643 0388

BRADFORD
Photosave
18 Cheapside
Tel: 0274 308598

BRENTWOOD
New store opening
Phone 0279 58371 for details

BURTON ON TRENT
Leisurebase
In-store at East Midlands Co-op
12-13 High St
Tel: 0283 46545

CARDIFF
Leisurebase
13/15 Morgan Arcade
Tel: 0222 394182

CHELMSFORD
Godfrey's Photomarket
54 High St
Tel: 0245 355230

CHESTER
Chester Camera Centre
9 Bridge Street Row
Tel: 0244 26531

COVENTRY
New store opening
Phone 0279 58371 for details

CREWE
Crewe Camera Exchange
265 Edleston Rd
Tel: 0270 256854

DERBY
Leisurebase
In-store at East Midlands Co-op
Albion St
Tel: 0332 44410

EDINBURGH
(Morningside)
Beejay Micro Hire Services
63 Viewforth
Tel: 031 229 0332

EXETER
New store opening
Phone 0392 211212 for details

HENLEY ON THAMES
G Bushell & Son
37 Hart St
Tel: 0491 572363

KINGSTON-UPON-THAMES
The Computer Shop
91 Acre Road
Tel: 01 546 3793

LEEDS
Leisurebase
67A Albion St
Tel: 0532 468335

LINCOLN
Leisurebase
352 High St
Tel: 0522 22248
(Cl. Wed)

LIVERPOOL
In-store at Blackers Department Store
16-26 Elliot Street
Tel: 051 709 2763

MANCHESTER
Chester Camera Centre
Mosley Arcade, Piccadilly Plaza
Tel: 061 236 5819
Leisurebase
Upper Mall
Marsden Way
Arndale Centre
Tel: 061 832 6562

MARGATE
East Kent Computers
282 Northdown Rd
Cliftonville
Tel: 0843 23204

PENZANCE
Leisurebase
14 Causewayhead
Tel: 0736 4407

PLYMOUTH
Leisurebase
In-store at Dingles
Royal Parade
Tel: 0752 670505

PRESTON
Channel 8 Software
51 Fishergate
Tel: 0772 53057

READING
Leisurebase
31 Station Rd
Tel: 0734 597795

SHEFFIELD
Leisurebase
1 Charter Sq
Tel: 0742 25354

SHREWSBURY
Shrewsbury Camera Exchange
The Maltings, Roushill
Tel: 0743 4964

ST HELENS
Opening Soon
Dee Bee's
55 Ormskirk St
Tel: 0744 39496

STOCKPORT
Stockport Camera Exchange
76 Princess St
Tel: 061 477 7041

SOUTHAMPTON
Leisurebase
19 East St
Tel: 0703 38753

SOUTHEND
J Patience Ltd
9 Queens Rd
Tel: 0702 49547

SWANSEA
Leisurebase
218/219 Oxford St
Tel: 0792 476099

SUNDERLAND
Saxons (Photomarket & Hi-Fi) Ltd
20-22 Waterloo Place
Tel: 0783 657578

WEMBLEY
Leisurebase
397B High Rd
(opp Argus)
Tel: 01 903 0587

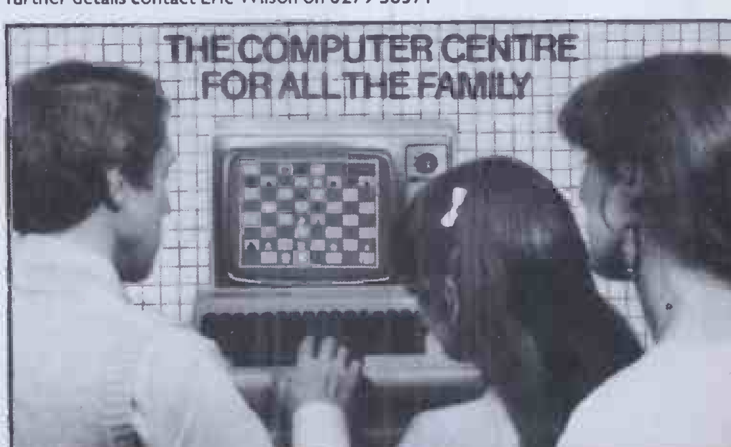
WESTON-SUPER-MARE
Leisurebase
5 Waterloo St
Tel: 0934 24364

WORKSOP
BSB Computers
11 Carlton Rd
Tel: 0909 486251

STOCK AVAILABILITY
Whilst your local Leisurebase stores can supply the widest possible range of equipment we are not able to guarantee that every advertised item will be available in each store.

MAIL ORDER
Many Leisurebase stores are prepared to supply equipment on a mail order basis. Please telephone the store closest for P & P rates.

HEAD OFFICE/WAREHOUSE
Unit 9, Raynham Road Industrial Estate, Bishops Stortford, Herts. If you require further details contact Eric Wilson on 0279 58371



LEISUREBASE

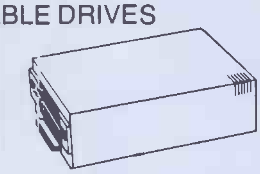
1 YEAR'S WARRANTY

OPUS DISC DRIVES

★ PRICE ★ PERFORMANCE ★ PERFECTION

OPUS MICRODRIVE 3″ DOUBLE-SIDED 40 TRACK

- ★ TWICE THE CAPACITY ON LINE OF OTHER AVAILABLE DRIVES
- ★ 200K S/D, 400K D/D
- ★ EX-STOCK DELIVERY
- ★ 3 Ms ACCESS TIME
- ★ LOWEST POWER CONSUMPTION
- ★ TOTALLY COMPATIBLE WITH 5¼″ DRIVES
- ★ DIRECT DRIVE



SINGLE DRIVE — **£199.00**

DUAL DRIVE — **£399.00**

FREE — On first 100 orders received we will supply case and leads free of charge

5¼″ JAPANESE DISC DRIVES

★ COMPLETE WITH CASE AND ALL LEADS ★

SINGLE DRIVES

TEAC 55A S/S 40 track
100K S/D, 200K D/D **£149.95**

National Panasonic JA551 D/S 40 track
200K S/D, 400K D/D **£186.00**

TEAC 55F D/S 80 track
400K S/D, 800K D/D **£229.95**

Hardware switchable 40/80 track

- ★ All drives are supplied with metal textured cases and all leads included
- ★ Fast access time
- ★ ½ height
- ★ State of the art technology
- ★ Low power consumption
- ★ Ex-stock delivery

DUAL DRIVES

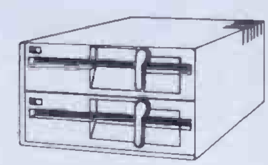
Dual TEAC 55A
200K/400K drive **£319.95**

Dual National Panasonic
400K/800K drive **£349.95**

Dual TEAC 55F
800K/1.6Mb drive **£475.00**

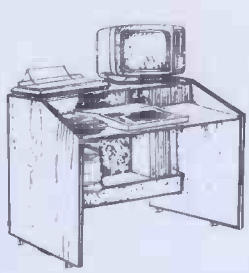
As illustrated 40/80 track switchable

- ★ All drives supplied with metal case with separate power supply
- ★ 3 Ms access time
- ★ ½ height



ALL ITEMS CAN BE PURCHASED SEPARATELY — RING FOR DETAILS

THE ORGANIZER DESK



ONLY
£49.50

- Teak finish
- On castors
- Self assembly
- Full instructions provided
- Top shelf for monitor/printer
- Large desk area
- Lower shelf for paper/book storage — ample room in front of the shelf for you to sit comfortably

12″ GREEN SCREEN MONITOR

One year warranty, ex-stock delivery
22mHz phono connector, limited quantity ...only **£69.95**
Lead to connect to BBC **£3.95**

ATHANA FLOPPY DISCS

MINIS		8″ DISCS	
S/S S/D	**£16.95** for 10	S/S S/D	**£17.95** for 10
S/S D/D	**£19.95** for 10	S/S D/D	**£23.95** for 10
D/S D/D	**£22.95** for 10	D/S D/D	**£24.95** for 10
S/S 80 track	**£24.95** for 10		
D/S 80 track	**£26.95** for 10		

With full 5 year warranty. All mini discs have hub rings and a free plastic library case

DOGFIGHT

If you have a BBC 32K with any O-S, become a flying ace with our wonderful new game, Dogfight.
An exciting 2 player game with 8 levels of difficulty, only **£8.65**

To Order: Add carriage at the following rates: Discs 85p, other goods £7.00. Add VAT at 15% to total and send order to:

OPUS SUPPLIES

158 Camberwell Road, London SE5 0EE
Tel: 01-701 8668 (3 lines) 01-703 6155/6/7

Government and Educational orders welcome

Opening Hours 9-6pm Mon-Fri
9.30-1.30 on Saturday


We've arrived...
more products...
more service...
more value.
C. Itoh Electronics Co. Ltd.,
Beacon House, 26-28 Worple Road, London, SW19 4EE.
Tel: 01-946 4960. Telex: 895 5616

... C. Itoh Electronics Co. Ltd.

The C. Itoh name means a unique combination of quality, high performance and flexibility in computer peripherals. C. Itoh's extensive range of printers will provide the *right* machine for *your* application at a price you can afford.

Performance — because in the latest additions to the 8510 range, print speed has been increased to 180 cps, and throughput is now 106 lpm. This makes the 8510S and 8510SC an impressive 30 per cent faster than other similar printers on the market.

The new printers offer high density bit graphics, and with the 8510SC you also get full colour printing capability.

Flexibility — because a unique feature is full plug compatibility with the existing 8510A and 1550 ranges. This means you can upgrade your installation simply by plugging in one of the new models.

It also means flexibility in terms of a wider application range — the number of international character sets has been increased from 5 to 13 on the new enhanced printers. Four standard character styles are condensed, normal, extended and italics. As with the rest of the new 8510 range, super- and sub-script are standard.

In common with the rest of the range, industry standard interfaces are serial: RS232C and parallel: TTL compatible.

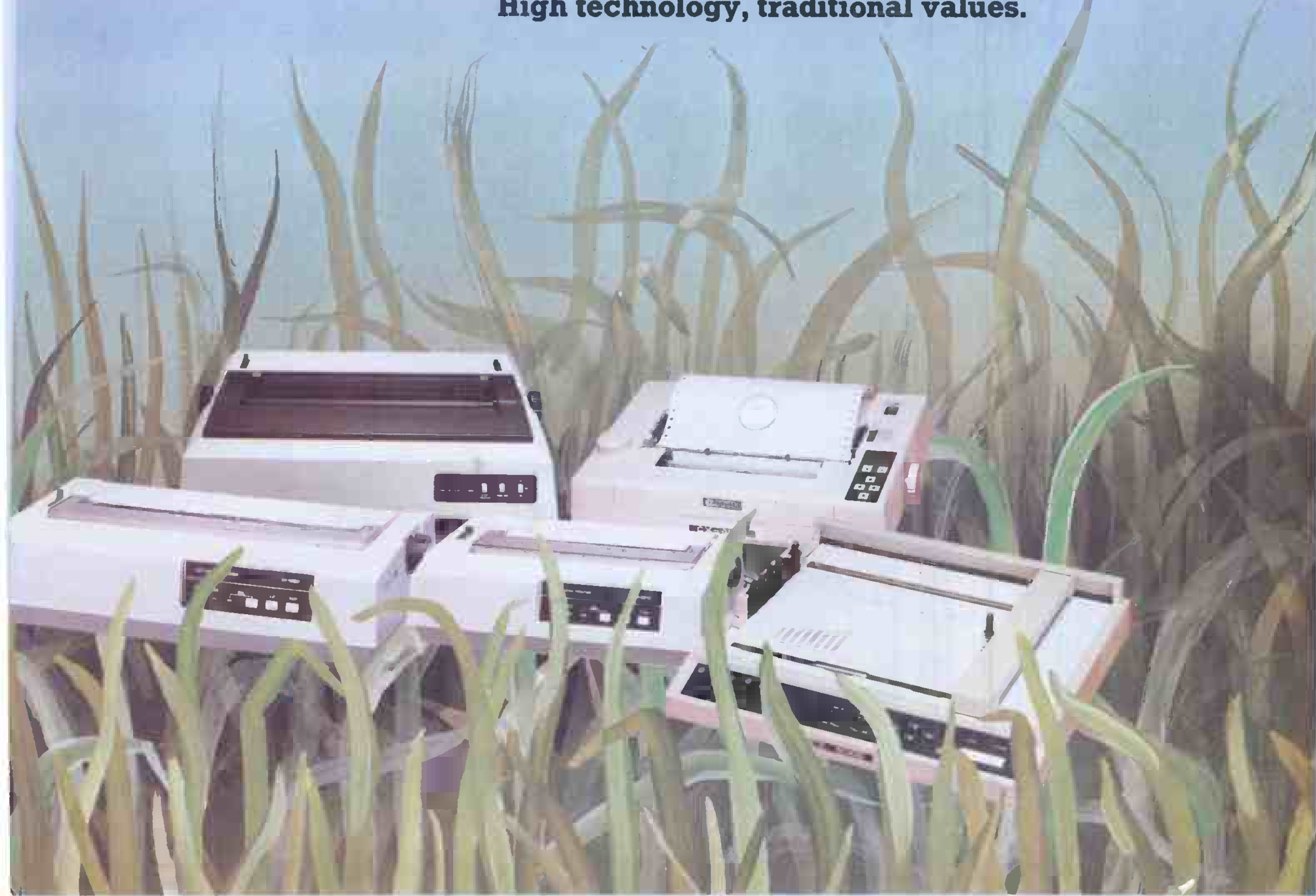
The 1570 (not shown) is a 133 cps 24-needle dot matrix printer capable of almost letter quality printing — 186 columns of 10 cpi or 231 columns of 17 cpi fount. A highly competitively priced unit, it includes many of the features of the new 8510 models, including the 13 international character sets.

For the user with small amounts of text the 20 cps A10 daisy wheel printer offers the highest output performance on the market for this type of unit. Representing superb quality printing for use with small micro-systems, it combines economy with the performance and reliability which have become C. Itoh's hallmark.

And now C. Itoh have brought this cost-saving to the field of colour plotters. The CX4800 drum type printer/plotter and the CX6000 flat bed model enable micro users to enhance their creativity with units featuring the latest advances in colour graphics.

Both plotters allow you to draw histograms, characters and a wide range of other highly sophisticated graphic images. With four colours on the CX4800 and six on the CX6000, both incorporate 8-bit parallel and RS232C serial interfaces as standard.

C. Itoh Electronics Co. Ltd.
High technology, traditional values.



MINICOMPUTALIKE.

PC + REVELATION ™

Pick compatible operating system

Variable length records

Extended BASIC

Relational Database

Enquiry language

Program Generator

The Pick operating system is fast becoming recognised as the optimum environment for commercial data processing. The IBM PC is the No. 1 personal computer. Combined with REVELATION ™, it bridges the gap between minicomputer and microcomputer.

As a front-end to the PC's natural operating system, REVELATION ™ brings the power and sophistication of Pick to the microcomputer without sacrificing access to mainstream software development.

REVELATION ™ now includes the R/DESIGN Program Generator. R/DESIGN is a highly productive programming aid that produces either interpretive code or BASIC source code.

ALSO EXCLUSIVELY AVAILABLE FROM IDM – TEXTPLUS – THE EXECUTIVE INFORMATION SYSTEM/WORD PROCESSOR THAT HAS TAKEN THE US PC MARKET BY STORM.

Contact IDM on 0302 786677, the exclusive UK distributor of IBM + PICK.

PICK on IBM SYSTEMS

IDM

Interactive Data Machines
Scawthorpe Hall Great North Road
Doncaster South Yorkshire
Telephone (0302) 786677

PCW 323

Why all other spreac

In the early days of micros, the first spreadsheets appeared, using complicated cell co-ordinate references to define plans.

This made the most of limited computing power but plans were tricky to write, and difficult to read later.

Today's micros are much more sophisticated but all the spreadsheets are more or less the same as they always were. All that is, except PlannerCalc and MasterPlanner. Described in a recent university report as "... the best spreadsheet package currently on the Market," PlannerCalc and MasterPlanner are true business aids.

Dyed in the wool calc freaks won't like them but businessmen will.

NEW USERS START HERE

PlannerCalc at £85.00* is now accepted as the first choice for people new to financial planning.

Designed for 8-bit micros, it boasts the kind of features that you'd expect to pay twice as much for. (Buy PlannerCalc's nearest rival and you'll have to.)

Unlike all other 'calc' products it allows you to enter calculations in a language you understand. Plain English.

For example:

LINE 1 SALES=100, 150, 175, 210
LINE 2 EXPENSES=GROW 70 BY 15% FOR 4
LINE 3 NET=SALES−EXPENSES
LINE 4 CSALES=CUM SALES
COLUMN 5 YEAR=SUM OF COL 1 THRU COL 4

So it's much easier to use.

It uses the popular "spreadsheet" approach with a window that can be rolled in all directions.

Which means you can enter new figures and rules and immediately see their effect on everything else in the model.

It comes with the best manual on the market and it's suitable for most micros with a ™CP/M 2.2 operating system, 64K of memory, giving at least 900 cells, minimum screen width of 80 characters and 2 floppy disc drives.

MUCH MORE POWER, NOT MUCH MORE MONEY

MasterPlanner is the most powerful spreadsheet system currently available wi its increased matrix size, 2000-3000 cells o most 64K micros. (But at £245* it certain isn't the most expensive.)

Consolidation of models, allows you create separate plans for each department ar then combine them into an overall compar

COMSHARE DEALERS

Aberdeen
Ablext Ltd
(0224) 647074

Aldershot
EMS (UK) Ltd
(0252) 313551

Altrincham
Associated Computer Services
(061) 941 4225

Aylesbury
Helstaar Systems Ltd
(0296) 630364

Barnsley
Brook Office Supplies Ltd
(0226) 88916

Bedford
MSC Hiland Ltd
(0234) 50260

Benfleet
Conquest Computer Sales Ltd
(03745) 59861

Birmingham
Computaccount
(021) 236 3455

Blackburn
BEC Systems Services Ltd
(0254) 677215

TDS Bus Systems Ltd
(0254) 676915

Bradford
Compright
(0274) 668890

Raven Computers Ltd
(0274) 306966

Bristol
Avon Microcentre Systems Ltd
(0272) 277774

C.C.E. (Europe Ltd.)
(0454) 321088

Mercator Computer Systems Ltd
(0272) 731079

Transtec Ltd
(0272) 277462

Bury St. Edmunds
S.I.R.C.S. Ltd
(0284) 62022

CPS (Data Systems) Ltd
(021) 707 3866

Camberley
Alexander Systems Ltd
(0276) 28971

Cambridge
Business Computers (Cambridge) Ltd
(0223) 357130

Canterbury
Kent Micro Systems
(0227) 50200

Julea Ltd
(0227) 830083

Cardiff
Bowstrings Computer Services Ltd
(0222) 36825

Chatham
Medway Computers Ltd
(0634) 826080

Chesterfield
Nastar Computer Systems
(0246) 207048

Clevedon
Bard Computer Systems Ltd
(0272) 878 157

Doncaster
Briarstar Computer Centre
(0302) 67135

Dublin
Transtec Ltd
(0001) 718521

Fareham
Electronequip Ltd.
(0329) 230670

Gosport
Vauntberry Ltd
(0329) 235846

Grantham
The Soft Option
(0476) 860171

Harpenden
Irradion Ltd
(05827) 62421

Hastings
BMS Computer Services Ltd
(0424) 439190

Hereford
Honeysett Computers Ltd
(0432) 279404

Hitchin
McVeigh Business Systems Ltd
(0462) 50386

Huddersfield
Micrologica Systems
(0484) 47450

Ipswich
Anglia Microsystems
(0449) 740046

Leamington Spa
Words Ltd
(0926) 30209

Leicester
Leicester Micro Centre
(0533) 551869

Lisburn
MKM Electronic Ltd
(08462) 3184/3665

Liverpool
BEC (Liverpool) Ltd
(051) 263 57 X

London
BD Computer Systems
01-435 4442

Business Information Systems
01-373 3113

Datapower Ltd
01-437 5994

Clenlo Computer Systems Ltd
01-670 4202

Corporate Modelling Consults
01-628 4107

Dantedale Ltd
01-519 7004

DIR Computer Systems Ltd
01-439 4354

Equinox Computers Ltd
01-739 2387

Ferran Software Ltd
01-751 5791

Interlex
01 943 0968

Jarrogate Ltd
01-671 6321

Ludhouse Computing Ltd
01 679 4321

Matmas Electronics Ltd.
01-373 6607

Mayfair Business Systems Ltd
01-688 3836

MGE Systems Ltd
01-439 9617

Micronics Telesystems Ltd
01-263 6926

Nokia (UK) Ltd
01-900 0421

Pinewood Computers Ltd
01-504 0403

P.W. Hare & Associates
01-551 1988

Archives U.K. Ltd
01-223 1688

Software Ltd
01-387 9927

Stag Terminals Ltd
01-943 0777

Statacom Ltd
01-661 2266

Sumlock Bondain Ltd
01-250 0505

Sun Business Services Ltd
01-739 7949

Transam Computers Ltd
01 402 8137

Whispa Ltd
01-556 9151

Malvern
Malvern Micro Systems
(06845) 68500

Melksham
Citer Systems Ltd
(0225) 706361

ICEN Ltd
(0225) 702133

Midhurst
Wordskill Automation Ltd
(073081) 6641

Milton Keynes
Pericom Data Systems Ltd
(0908) 614242

Navan
S Triple S Ltd
(046) 28472

Nottingham
Micropeople Ltd
(06074) 69117

Oxford
Choice Business Systems
(049161) 2697

Rayleigh
V J Parkins Associates
0268 743928

Redcar
Applestop
(0642) 474707

Richmond
Intech Computer Serv
01-948 4213

Rutland
Microspecific Ltd
(0572) 2528

Slough
KGB Micros Ltd
(75) 38581

Southampton
Xitan Systems Ltd
(0703) 38740

St Albans
St Albans Computer Services Ltd
(0727) 77700

St Helier
The Processor Centre
(0534) 77070

Thomas & Company
(0534) 77700

West Byfleet
Fergusson Computer Ltd
(91) 41810

West Drayton
Frasers Ltd
81 41731

Weston Super Ma
Eastfern Ltd
(0934) 418346

Weybridge
Kewill Systems Ltd
0932 52046

Winchester
Modular Office Systems Ltd
(0962) 55759

Yatton
Glove Business Mach
0934 835222

Yeovil
Dale Computer Systems Ltd
(0935) 72000

heets are out of date.

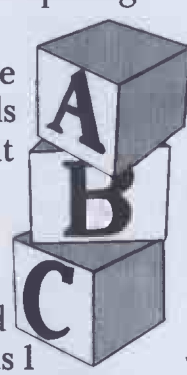
plan. Data transfer to word processing and other systems lets you incorporate figures in reports and output to a data base. It also has extensive formatting facilities which means you can produce reports that wouldn't look out of place in the board room.

It can store up to 25 standard reports to run when you need them. It's got full WHAT IF? analysis and direct editing of both spreadsheet and logic display.

JUST AS EASY TO USE

All this increased power doesn't mean you'll need a degree in advanced computing to understand MasterPlanner.

It works on exactly the same system as PlannerCalc and models written on PlannerCalc run without modification on MasterPlanner.



16 BIT VERSION

A new version of MasterPlanner has been specifically designed for the 16 bit micros like the Sirius 1 under ™CP/M-86 or the IBM personal using either CP/M-86 or ™MS DOS 1.1. With a vast matrix size of over 7000 cells on 128K and even more with larger memory, you'll at last be able to make the most of your micro.

ULTIMATE POWER

Fastplan is the top Comshare micro planning system.

It's file-based, allowing development of large scale models; with a staggering 18,000 cell matrix; full financial functions plus backwards iteration, file input and output; and much more. Yet, because it can be menu driven it is easy to use. For the full story, tick the Fastplan box when you return the coupon.

OVER 10 YEARS EXPERIENCE

When you invest in MasterPlanner or PlannerCalc you're not just getting the best software money can buy.

You're also getting the kind of back up and after-sales service that only a company of Comshare's track-record can guarantee.

If you'd like to know more about any product, call in at your local dealer or fill in the coupon and send it to us.

*Plus VAT and post & package.

COMSHARE

Making the computer make sense.

*CP/M and ™CP/M-86 are the registered trade marks of Digital Research Inc.
Comshare Ltd., 32-34 Great Peter Street, London SW1P 2DB. Telephone: 01-222 5665.

To: Department 1WM, Comshare Ltd., 32-34 Gt. Peter Street, London SW1P 2DB.
Please send me:

Qty	Product	Micro	Op System	Disc Size	K	Amount £	p.
	PlannerCalc @ £99.50 (8 bit only)		CP/M 2.2	8"/5¼"			
	MasterPlanner @ £282.95		CP/M 2.2	8"/5¼"			
	MasterPlanner	IBM PC	MS DOS 1.1	8"/5¼"			
	MasterPlanner		CP/M-86	8"/5¼"			
All prices include VAT and postage & packing					TOTAL		

Please send me information about Fastplan ☐

I enclose a cheque/postal order for £_____ made payable to Comshare Ltd.
Please debit my Access Card No._____ for £_____
Barclaycard No._____ for £_____
Signature_____
Name_____
Address_____
_____ Tel. No._____
Please allow 28 days for delivery. VAT No. 238418649. Registered No. 980406.

Comshare reserve the right not to accept any orders. Any acceptance will be subject to Comshare's terms and conditions.

SIEMENS

Some printers should come supplied with a pair of these

You won't need ear defenders with the Siemens PT88 Ink-Jet Printer.

We guarantee it. Because even at 150 cps the ink-jet printing on the low-cost, high-performance PT88 printer makes hardly a whisper.

So wherever silence is the golden requirement – at work or at home – the PT88 is the printer that's easy on the ears.

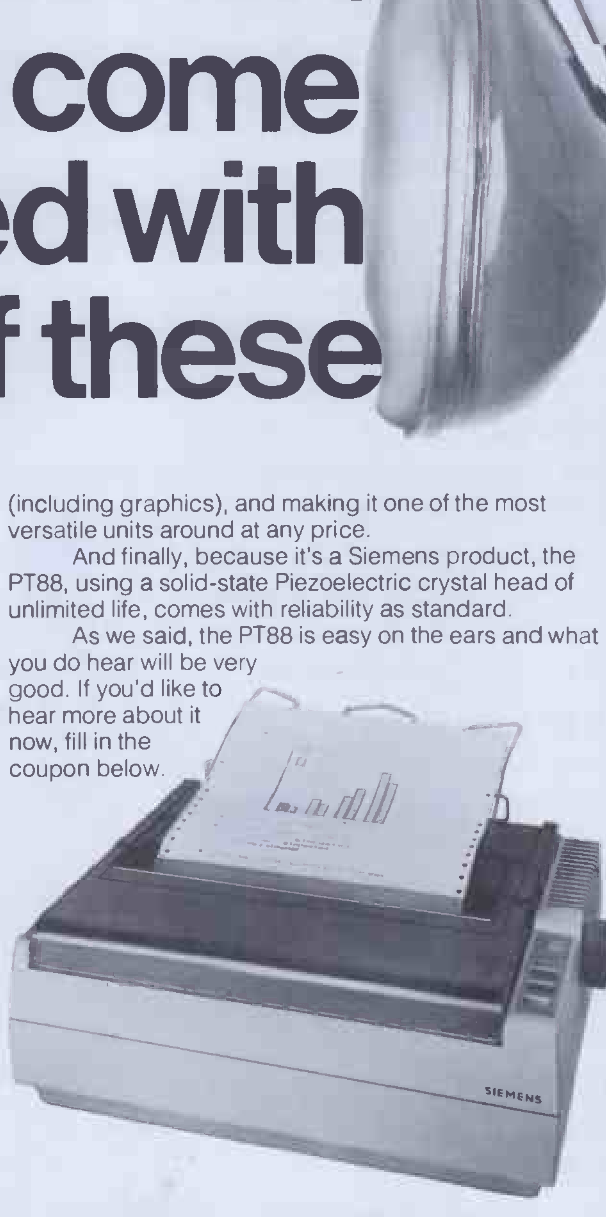
The PT88 has quality as well as quietness, as you'd expect from a second-generation printer backed with the matchless pedigree of the proven Siemens ink-jet unit. The ink-jet version is based on a simple, but effective, highly reliable 'drop on demand' principle, incorporating nine precision-controlled nozzles. As with all Siemens ink-jet printers, ink is supplied in easy-to-change cartridges, each with capacity for 5 million high-quality characters.

Both the ink-jet head and the needle printing head use the same print matrix and character font. The 9x9 dot matrix provides for descenders and under-scoring with expanded print and proportional spacing also possible.

The integrated paper feed is real value-for-money, taking fan-fold paper, roll paper or single sheets without modification. What's more, a range of interfaces and expansion boards – all of which are easily inserted by the user – are available to 'tailor' the PT88 to a host of commercial, industrial and scientific applications (including graphics), and making it one of the most versatile units around at any price.

And finally, because it's a Siemens product, the PT88, using a solid-state Piezoelectric crystal head of unlimited life, comes with reliability as standard.

As we said, the PT88 is easy on the ears and what you do hear will be very good. If you'd like to hear more about it now, fill in the coupon below.



Siemens offers a single source of supply for all telecommunications OEM requirements, including Facsimile, Telex terminals and telephones. For more information on any of these, tick the appropriate box.

Siemens - One source

Siemens Limited Marketing Services
Windmill Road Sunbury on Thames Middlesex TW16 7HS

☐ Printer Terminals ☐ Telex ☐ Telephones ☐ Facsimile

I am ☐ End User ☐ Dealer ☐ OEM/Distributor

PCW

Name ______________________

Company ______________________

Address ______________________

____

____

______________________ Tel: ______________________

Dennison

The disk preferred by professionals

Dennison are the leading quality flexible disks currently used and recommended by top software and hardware manufacturers and distributors throughout the world.

The disks have been specially developed for the computer professional in order to meet the industry's exacting and most advanced standards, including the latest high density requirements.

All customer enquiries to:

LONDON

City Microsystems
65 London Wall
London EC2
Tel: 01-588 7274

Computaline
14-16 Oxford Circus Ave.
231 Oxford Street
London W1
Tel: 01-434 4017

Computerland
38 Edgware Road
London W2
Tel: 01-723 3071

Concept Computers
445 Hackney Road
London EC2 9DY
Tel: 01-729 1800

Consup
33-35 Finck Street,
Off Upper Marsh
London SE1 7EN
Tel: 01-928 3252

WH Hayden
52 Holloway Road
London N7 8JL
Tel: 01-607 2755

Keyboard Hire
176 Barnsbury Road
London N1
Tel: 01-607 8797

Lion Micros
227 Tottenham Court Road
London W1P OHX
Tel: 01-580 7383

Melki & Co
Melki House
Gambia Street
Blackfriars
London SE1 OXE
Tel: 01-633 9199

Microcomputation
8 Station Parade
Southgate
London N14
Tel: 01-882 5104

01 Computers
Southampton House
192-206 York Road
London SW11 3SA
Tel: 01-928 8860

Office Efficiency Machines
150-152 King Street
London W6
Tel: 01-748 8404

Planning Consultancy Ltd
46-47 Pall Mall
London SW1Y 5JG
Tel: 01-839 3143

Silicon Valley Group 18 Ltd
16 Baldwins Gardens
London EC1
Tel: 01-242 2803

Steiger Computers Ltd
Steiger House
North Circular Road
Stonebridge Park
London NW10 7QZ
Tel: 01-961 6000

Stemmos
199 Uxbridge Road
Shepherds Bush
London W12
Tel: 01-740 9444

Transam Microsystems
59-61 Theobalds Road,
London WC1
Tel: 01-405 5240

West London Micro Centre
6 Pavilion Parade
Wood Lane London W12
Tel: 01-743 9000

HOME COUNTIES

Autocrat Computers Ltd
264 Preston Road
Harrow Middlesex
Tel: 01-908 3636

Aylesbury Computers
New Street,
Old Exchange,
Aylesbury, Bucks
Tel: 0296 87309

Fletcher Dennys Systems
York House
Great West Road
Brentford Middx TW8 9AB
Tel: 01-560 7331

Fraser Associates
1 Bristle Hill
Buckingham
Bucks MK18 1EZ
Tel: 0280 816087

Frasers Ltd
22a Chapel Street
Marlow Bucks
Tel: 06284 75606

Lombard Services Ltd
2nd Floor
Canada House
272 Field End Road
Eastcote, Ruislip
Middx HA4 9NB
Tel: 01-868 0942

STC Micros
West Road
Harlow, Essex
CM20 2BP
Tel: 0279 443421

Telesystems Ltd
Kingsmead
Moat Drive
Prestwood, Bucks
Tel: 02406 5314

WCS
139 St Margarets Road
Twickenham
Middx TW1 1RG
Tel: 01-892 0165

MIDLANDS

Atlas Computer Division
Saxon House
Heritage Gate
Friary Street, Derby
DE1 1DD
Tel: 0332 44205

Computer Services Midlands Ltd
Dunlop India House
Abbeyfield Road
Lenton Industrial Estate
Nottingham NG7 2SZ
Tel: 0602 866366

Days Office Supplies Ltd
Eskdaill Street
Kettering, Northants
Tel: 0536 512065

Donnington Computers
114a Friar Gate
Derby DE1 1EX
Tel: 0352 43090

The Warwickshire Computer Centre
14 Hamilton Terrace
Royal Leamington Spa
Warwickshire
Tel: 0926 311873

SOUTH AND SOUTH WEST

Advanced Technology
72-75 Feeder Road
Bristol BS2 OTQ
Tel: 0272 716401

Allegro Computer Services Ltd
Bishops Waltham
Abbey Mill
Southampton SO3 1DH
Tel: 04893 6266

Avon Business Computers Ltd
192 Wells Road
Bristol, Avon BS4 2AX
Tel: 0272 779452/3

Computerland
Spencer House
12-14 Carlton Place
Southampton SO1 2EA
Tel: 0703 39571

WALES

Aberdata Ltd
4 Chancery Lane
Cardigan, Dyfed SA43 1HD
Tel: 0239 613915

NORTH

Bridlington Computer Services
72 Bessingby Road
Bridlington
North Humberside
YD16 4SH
Tel: 0262 77115

Datron Microcentres
2 Abbeydale Road
Sheffield S7 1FD
Tel: 0742 585490

Key West Electronics
36 Hallgate
Wigan, Lancs
Tel: 0942 44444

Prospect Computer Systems
55 East Parade
Harrowgate
W Yorks
Tel: 0423 501008

Zak Computers Ltd
Churchill House
88-92 Talbot Road
Manchester M16 0PD
Tel: 061 872 7818

SCOTLAND

Gidman Media
Glen Centre
22 Union Glen
Aberdeen AB9 1DY
Tel: 0224 20233

NORTHERN IRELAND

CEM Computing Services
117 University Street
Belfast. BT7 1HP
Northern Ireland
Tel: 0232-244111

CHANNEL ISLANDS

Dynatech Microsoftware Ltd
Ken Riches
11 Westerbroome
South Side, St Sampsons
Guernsey
Channel Islands
Tel: 0481 48066

CYPRUS

Data Services Ltd
22 Ionos Street
PO Box 1604
Nicosia
Tel: Nicosia 52325
Telex: 3649 DATA

DENMARK

Formula Micros
Walgerholme 6
2750 Ballerup
Denmark
Tel: 266 11221
Telex: Denmark 85163

GREECE

Data Computer Corporation S.A.
Bouliagmenis 2
Athens
Greece
Tel: Athens 8942588

NORWAY

Norsales
Knott Johansson
Hedemarksgt 15
OSLO 6, Norway
Tel: 680 555
Telex: (856) 72788

REPUBLIC OF IRELAND

Portable MicroSystems
18 Dame Street
Dublin 2
Republic of Ireland
Tel: Dublin 712844

Further information and Dealer enquiries to:

Media Technology

38 Mount Pleasant, London, WC1X 0AP
Telephone: 01-278 7465 Telex: 261177

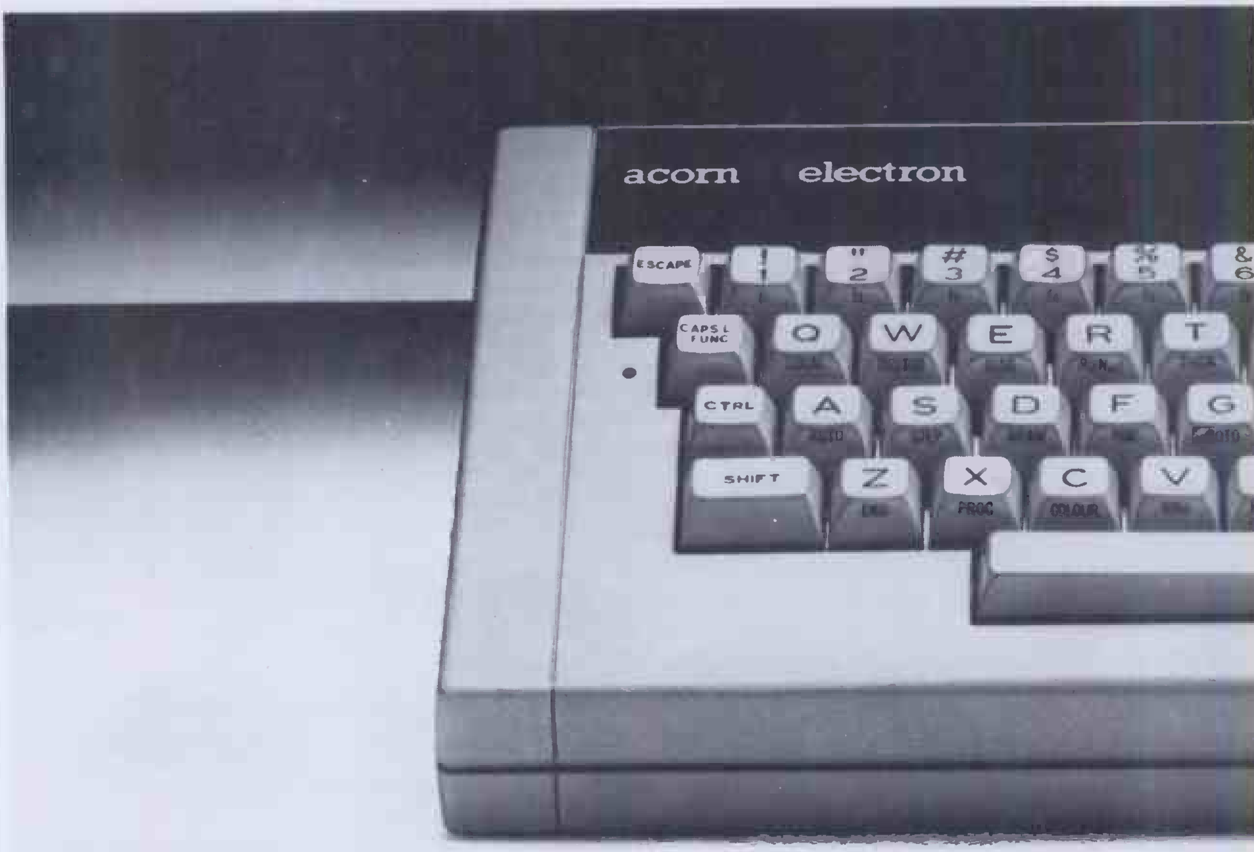
Compudata markets one of the most powerful and fastest microcomputers in the world. This is due to the application of an 8086 microprocessor and an 8087 arithmetic co-processor.
The Fourth Generation is now a fact. Not only the speed is important, but also the very highest ergonomic requirements that are satisfied. The ease with which the TULIP SYSTEM®I can be operated is unparalleled, partly due to the vast keyboard with its 104 keys. What is more, TULIP SYSTEM®I can be used with many types of available software.

The capacity? Internal storage of 128 Kb to 896 Kb, external storage of 350 Kb floppy disks and 5 Mb removable winchesters to 20 Mb fixed winchesters. The 8 standard character sets ensure maximum flexibility. The colours and the high resolution graphics make the TULIP SYSTEM®I unique. Contact your dealer, he can tell you all about it, or write Compudata.

Computer ● Processor: 8086, 8087 (opt) ● Clock: 8 Mhz ● RAM: 128-896 Kb ● Serial I/o: RS-232 ● Parallel I/o: Centronics comp. ● Interfaces: Hard-disk, tape, lightpen ● Fl. disk controller: 8 inch + 5 1/4 inch ● Bufferd Keyboard: 104 keys **Storage** ● Floppy disk: Dual 5 1/4 inch; 1.5 Mb ● Hard disk – fixed: 5 Mb, 10 Mb, Hard disk – removable: 5 Mb **Display** ● Formats: 80 x 25, 64 x 31, 40 x 25 ● Low res. graphics 100 x 160 ● High res. graphics: 786 x 288 (opt) ● Colour: 8 ● Internat. char. sets: 8 softw. selectable.

Headquarters The Netherlands: Compudata B.V., Hambakenwetering 2, 5231 DC 's-Hertogenbosch. Tel. 073-422045. Telex 50316 cdata nl.
Belgium: N.V. Compudata SA, Brusselpoortstraat 8, B-2800 Mechelen. Tel. 015-422480. Telex 64698 cdata b.

COMPUDATA



Chances are, w
your new A

If you're itching to get your fingers on this long-awaited computer, your best bet is to find a major branch of W. H. Smith, because we're the only major store that stocks it.

Of course it's not surprising that it's proving to be so popular.

A selection from the range of Acorn Electron software.

It speaks BBC Basic. Its 56 key electric typewriter styl keyboard is robustly constructed with a good solid feel.

The Electron provides seven different display modes from high resolution graphics necessary in games, to a full eighty columns of text

ll be supplying
orn Electron

across the the screen. It comes not only with a comprehensive user-guide, but also with a book that takes you through the principles of Basic programming, as well as a demonstration cassette containing fifteen programs.

And it costs only £199: at this price and with its impressive specification, the Acorn Electron represents outstanding value for money.

As well as the Electron, you'll find we have the range of Electron software.

So come in and see us at W. H. Smith.

WHSMITH

Price correct at time of going to press. Subject to availability. Available at selected branches only.

عرب رام

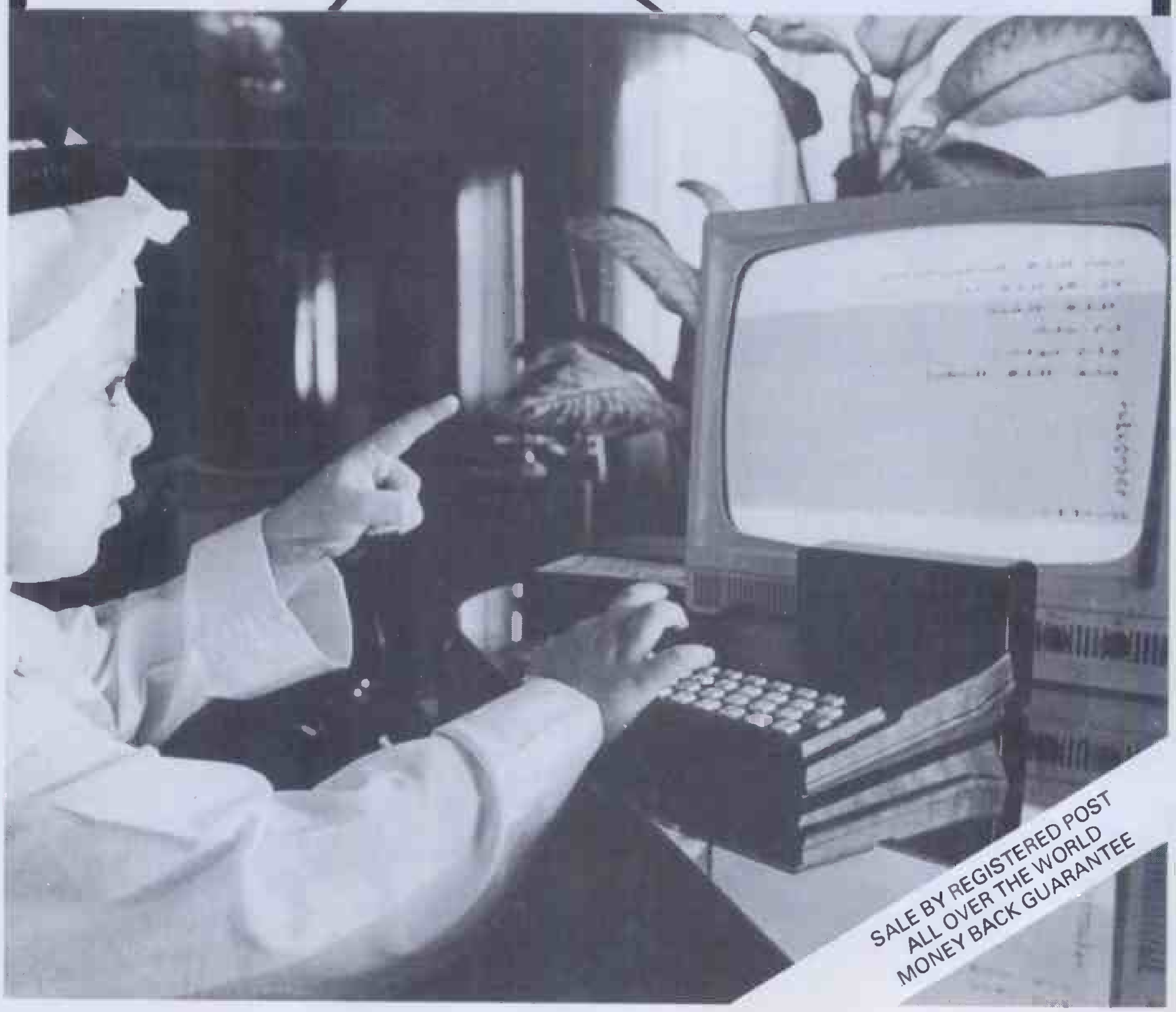
ARAB RAM, the ingenious Saudi invention that converts your sinclair ZX81 into the First Arabic Personal Computer in the world.

Do not miss this opportunity send your cheque now.

450 S·R

AUTORAM

RAMEZ HALABY & CO.
P.O. BOX: 147, JEDDAH,
SAUDI ARABIA
TEL: 660-4212
TELEX: 402276 AUTORAM SJ
CABLE: AUTORAM JEDDAH



EXPOSED!

THE JUKI 6100 DAISYWHEEL PRINTER OFFERED AT AN ALMOST UNPRINTABLE PRICE;

£339-95

EXCLUDING VAT

FREE CARRIAGE

- 18CPS — Bi-Directional Logic Seeking
- 10, 12, 15 CPI + Proportional Spacing
- "Drop in" Daisywheel — Triumph Adler Compatible
- Supports all Wordstar features
- Diablo protocols — IBM Selectric ribbon
- 2k Buffer as standard — 100 character Daisywheel

To Oakleaf Computers Ltd., 121, Dudley Road, Grantham, Lincolnshire.

☐ Please send me Further details of the Juki 6100 Daisywheel Printer

☐ I would like to take advantage of your special low price and FREE Carriage

Please send me

______________(quantity) Juki 6100 Daisywheel Printer at £339 excluding VAT each.

I enclose cheque for £______________

Please Debit my Access/Barclaycard No. ______________

Name____________________________

Address____________________________

Post code ______________

Day Time Tel No. ______________

OAKLEAF COMPUTERS LIMITED

121, DUDLEY ROAD,
GRANTHAM,
LINCS.
0476 76994/70281

100, BOUGHTON
CHESTER
CHESHIRE
0244 310099

The new boy from Acorn already has a gang of playmates.

The Acorn Electron, Britain's most exciting new home micro, already has a range of software programs specially designed for it by Acornsoft, makers of softwar for the BBC Micro.

There are six mind-boggling games, two programm ing languages, two exciting graphics cassettes, a home educational program and a personal money managemen program.

All of which will soon help familiarize you with th Electron and show you how to get the maximum enjoymen out of it straight from the word go.

Of course, we'll be constantly designing new softwar to help you fully realise the Electron's limitless potential.

You'll find all the programs featured here, plus the ful

The Electron. The new boy from Acorn.

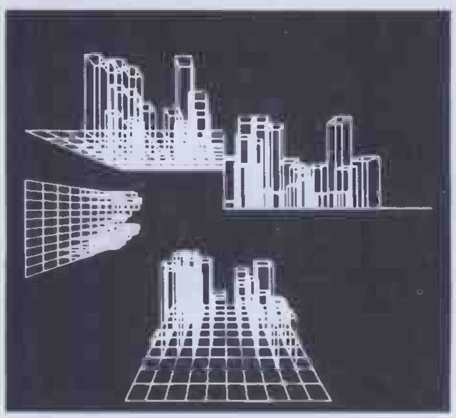
512 x 512 GRAPHICS

Digisolve offer you a way to increase your graphics speed and resolution. Using a high speed graphics processor, our cards draw lines and characters FAST. The graphics processor works in parallel to the host machine, and gives you the power of using a co processor specifically designed for graphics. With drawing rates of up to 1,500,000 pixels per second, lines appear instantly to speed up your plotting.

With the resolution, we offer new possibilities for software and systems. No longer is it necessary to consider one of the new 16 bit personal computers because of their better graphics. Digisolve offer a card designed for the Apple II to give 512 × 512 monochrome graphics. With the development of an 80 × 57 line Visicalc and Applewriter pre-boot, serious business users are no longer finding 80 column cards good enough. We also offer a colour unit designed to connect to any computer to give the same resolution but with 64 colours.

Digisolve are committed to the development of graphic systems and character display equipment and have a rapidly growing software base to help you use better graphics.

APPLE II CARD



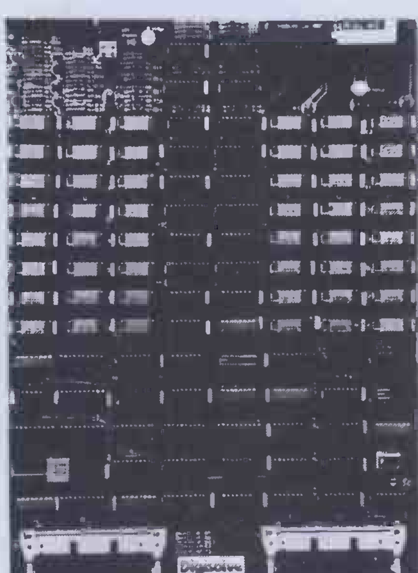
APPLE II

Digisolve's Apple II High Resolution Vector Graphic Processor Card quadruples the screen resolution and saves using up your Apple's memory space. The enhanced Applesoft support disc supplied with our card provides the powerful graphics functions and simplifies the conversion of existing software.

* Draws vectors at up to 1,500,000 pixels per second
* 512 × 512 pixels resolution
* Graphics and characters mixed, allows proportional spacing and up to 85 characters by 57 lines of text
* 64K bytes of on board memory will store two pictures for animation or have one text and one graphics page
* 4 different line types for clarity
* Blocks of variable sizes may be drawn to speed up area filling
* Read modify write mode for drawing cursors
* Screen read mode for dumping drawings to a printer
* £399 + VAT + P&P

SOFTWARE: 2D/3D Sketching packages. Architectural Design & Modelling. Kitchen Design. Draughting. Report Presentation.

Turtle Graphics, TASC & Apple Soft software support.



VGP64

VGP 64

Digisolve offer you high resolution colour graphics too. Designed to plug into any computer with a bus host adapter. The VGP 64 gives you 512 × 512 pixels in 64 colours. With its own vector processor and 384 K bytes of memory your computer can become a sophisticated graphics system.

* 64 colours that may be expanded with a pallette or extension video RAM card
* 512 × 512 pixels resolution with fast vector processor
* 384 K bytes of video RAM on board
* 2 pictures may be stored simultaneously in full colour for animation
* In monochrome 12 pictures may be stored and selected for display under software control individually or for animation
* Available as a boxed unit complete with power supply, or in board form to OEM customers
* Will plug into Apple, Commadore, IBM, Sage, S100 systems, PDP11 or any computer with a bus
* Available in several versions: 8 colour £799 64 colour £899

VDU BOARD

NOW Digisolve offer you the cheapest way to make a scrolling VDU with our intelligent 80 × 24 VDU card. With over 50 control functions the card works at up to 19.2 K baud.

* 80 Characters × 24 lines of text (optional 40 × 24, 40 × 12)
* Characters are properly formed with descenders
* Block graphics option
* Fully scrolling at 19.2 K baud
* Keyboard and RS232 data input

COMING SOON: Terminal emulations including TEK 4010 in monochrome and colour. Character displays 80 × 24 and A4 size

Digisolve

AIRE & CALDER WORKS
CINDER LANE, CASTLEFORD
WEST YORKSHIRE
TELEPHONE: (0977) 513141 or 513382
TELEX: 557661 AGRAM
A MEMBER OF THE LAMBSON GROUP

APPLE II is the Trade Mark of Apple Computers Inc.

Discount Micros!

SAVE HUNDREDS OF £££s

Thanks to our massive purchasing power you can now buy at probably the best prices on Micro hardware/software in the U.K.

Sirius 1 (2 x 600K Drives)  ~~£2,300~~ **£1,799*** INCLUDING ELECTRONIC SPREADSHEET PROGRAM **FREE!!**	**IBM PC** (2 x 320K Drives)  ~~£2,895~~ **£2,395*** INCLUDING ELECTRONIC SPREADSHEET PROGRAM **FREE!!**	**KAYPRO II** (Portable Computer)  ~~£1,700~~ **£1,399*** INCLUDING NEARLY £2000 WORTH OF SOFTWARE **FREE!!**
Sirius 1 +10 MB External Hard Disk plus 2 x 600 Floppy Disks.  ~~£4,200~~ **£2,995*** INCLUDING ELECTRONIC SPREADSHEET PROGRAM **FREE!!**	**IBM PC** +10 MB External Hard Disk plus 2 x 320 Floppy Disks  ~~£4,500~~ **£3,895*** INCLUDING ELECTRONIC SPREADSHEET PROGRAM **FREE!!**	**KAYPRO 10** with 10 MB Internal Hard Disk  ~~£2,900~~ **£2,495*** INCLUDING NEARLY £2000 WORTH OF SOFTWARE **FREE!!**

SPECIAL!

OLIVETTI M20

~~£2,500~~ **£1,995**

OVER 20% DISCOUNT

Other machines on request.
Plus a whole range of software & peripherals.

To place your order for IMMEDIATE DELIVERY, call Damien Scott on 01-938 1721 (20 lines)

*Offer lasts for limited period only and is subject to change without notice.

Discount Micros Ltd.
7/9/11 Kensington High Street, London W8.

Please send me

☐ Price list on ______ ☐ Information on ______ ☐ Ring me ☐ Urgent

Name ______ Title ______

Company ______

Address ______

______ Postcode ______

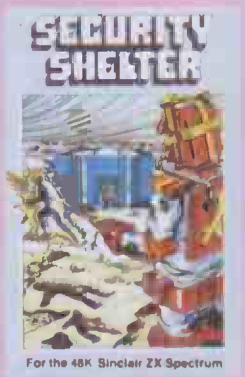
Phone ______ Extension ______

or every £1 of hardware you buy
ou can choose £1 of software
bsolutely free. (except Manta Printer)
R
or every £1 of software you buy
ou can choose £1 of hardware
bsolutely free.

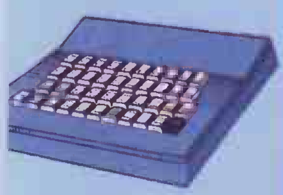
Arcane Quest
n you face the beastly one with othing but a cross and a heart full of purity?
:10 Spectrum 48K, Dragon 32, Oric 48, Commodore 64.

The Roundsby Incident
You are a mercenary in the Service of Rambol the Merchant. What is Roundsby's secret?
£10 Spectrum 48K, Dragon 32, Oric 48, Commodore 64.

3D Star Wars
'ou become Luke Clearthinker to battle an entire rebel space fleet on your own to save mankind?
£5 Spectrum 48K.



Security Shelter
You are a 'Gatherer' selected by your unique abilities to probe the mystery of the 'past timers' building.
£5 Spectrum 48K.



STANDARD KEYBOARD FOR SPECTRUM
The keyboard comes complete with high-impact black plastic case and typewriter-style keys. Full easy fitting instructions.
£30

STOP PRESS!

MANTA PRINTER®
Permanent hard copy of whatever is on the screen, prints 80 chars. per second, 40 cols. in width, upper and lower case letters and graphics.
Oric, Dragon, VIC 20, Commodore 64, Aquarius®, Spectrum, BBC.
£120

+ £30 of software

® Registered Trade Mark

EITHER choose the games you want then tick your free hardware to the same value
OR choose the hardware you want and tick your free software to the same value.

SOFTWARE	Qnty	Price	Total	Machine
Leopard Lord		£10		
Terror from the Deep		£10		
Ace in the Hole		£10		
Horror Atoll		£10		
Arcane Quest		£10		
Roundsby Incident		£10		
Cry Wolf		£5		Spectrum 48K
Ziggarat of Dread		£5		Spectrum 48K
Tobor		£5		Spectrum 48K
Chuckman		£5		Spectrum 48K
Lost over Bermuda		£5		Spectrum 48K
3-D Star Wars		£5		Spectrum 48K
Security Shelter		£5		Spectrum 48K
Games Pack 1		£10		VIC 20
Games Pack 2		£10		VIC 20
Games Pack 3		£10		VIC 20
Games Pack 4		£10		VIC 20
Fisherman Fred		£5		Spectrum
ExT		£5		Spectrum
Penguin		£5		Spectrum
Sea-Battle		£5		Spectrum
Cosmanoids		£5		Spectrum
Diamond Mine		£5		Spectrum
Golf		£5		Spectrum
Toolkit		£5		Spectrum
Grid Bug		£5		Spectrum
One-Arm Bandit		£5		Spectrum 48K
Efenders		£5		Spectrum 48K
Eteor Torn		£5		Spectrum 48K
'N' Vaders		£5		Spectrum 48K
Terroroids		£5		Spectrum 48K
Goblin Crusher		£5		Spectrum 48K
Never Trust a Blond		£5		Spectrum 48K
Picnic Adventure		£5		BBC
Assembler		£10		Spectrum 48K
Disassembler		£10		Spectrum 48K

Please indicate machine Total £____

NOW CHOOSE HARDWARE TO THE SAME VALUE

HARDWARE	Qnty	Price	Total	Machine
Keyboard		£30		Spectrum
The Light Pen		£30		
Sound Module		£10		BBC
Sound Module		£15		Spectrum

Please indicate machine Total £____

NOW CHOOSE SOFTWARE TO THE SAME VALUE

Manta Printer		£120		

All prices include P&P and VAT UK only (Add £1 for Europe)

I enclose cheque to the value of £____ or credit my Access ☐ Barclaycard ☐

No. ____________________ Exp. Date

Name ____________________

Address ____________________

____________________ Postcode ____________

Phone ____________

Signature ____________________ Send coupon to:

ADD-ON ELECTRONICS LTD
Units 2, 3 & 4, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ

This offer applies to mail order only

FOR THE BBC MICRO ■ SINCLAIR ZX SPECTRUM ■ DRAGON 32

PAN AND PERSONAL COMPUTER NEWS PRESENT

INSTANT INVADERS...INSTANT LASERS INSTANT SPACESHIPS...INSTANT BASIC! (FOR JUST £3.95!)

A new force in computer publishing. Three new books from the country's bestselling paperback publisher – PAN – and the most successful and authoritative computer magazine PERSONAL COMPUTER NEWS. At an unbeatable value for money price.

Not just another collection of listings. For the newcomer to computing Jean Frost's *Instant Arcade Games* will be nothing short of a revelation. This is not just the same old replays, but a library of software that also serves as one of the most accessible introductions to structured programming ever written.

Do you write your own software? If so *Instant Arcade Games* offers an invaluable library of imaginative subroutines and user defined graphics to enhance the efficiency and visual impact of your games programs.

Little or no knowledge of BASIC? You can still take a suite of 'skeleton' programs and create your own arsenal of dynamic and totally unique arcade games.

More for your money. Spaceships, motherships, firing and scoring routines – the book is packed with ready-made modules that can be slotted into virtually any kind of arcade-style program.

Where can you get them? From all good bookshops. Or fill in the coupon below and return it to: Pan Books Ltd., FREEPOST PO Box 109, 14-26 Baker Street, High Wycombe, Bucks HP11 2TD.

For immediate 24 hour service Telephone: 01-200 0200 and use your credit card.

GET MORE OUT OF YOUR MICRO WITH...

INSTANT ARCADE GAMES

POST NOW, NO STAMP NEEDED To Pan Books Ltd., FREEPOST, P.O. Box 109, 14-26 Baker Street, High Wycombe, Bucks HP11 2TD.
YES Please send me the following **Instant Arcade Games**...paperbacks at £3.95 each plus 35p for the first book ordered plus 15p for each additional book to a maximum charge of £1.25 to cover postage and packing.

name (Mr/Mrs/Miss/Ms) ______ ☐ BBC Micro ☐ Sinclair ZX Spectrum

address ______

______ postcode ______ ☐ Oric 1 ☐ Dragon 32

I enclose my cheque/postal order for £______ payable to Pan Books Ltd *or* debit my Access/Barclaycard/Visa/Trustcard

VISA no. ______

Signature ______ PCW1

Allow up to 15 days for delivery. This offer available within UK only.

Pan Books Ltd Registered in England Registration No. 389591

Pan

PERSONAL COMPUTER NEWS COMPUTER LIBRARY

PCW

NO CHARGE FOR

Atari • Commodore 64

NEW ATARI 600XL

A brilliant new computer from Atari. Before you choose a computer, check this specification.

- ★ 16K RAM expandable to 64K with one plug-in pack.
- ★ External processor bus for future CP/M module running CP/M2.2 with its own 64K RAM.
- ★ International character set.
- ★ 256 colours - up to 128 displayable at one time.
- ★ 5 text modes and 11 graphics modes.
- ★ Full-travel typewriter-style keyboard.
- ★ 24K built-in BASIC and operating system.
- ★ 4 special function keys.
- ★ Software compatible with almost all existing software for 400/800.

Atari 600XL Computer (AF77J)	Price £159.95
Extension RAM Pack for 600XL (AF79L)	Price £89.95
Program Recorder (AF80B)	Price £49.95
Disk Drive (AF81C)	Price £269.95
Colour Printer (plain paper) (AF83E)	Price £199.95
Letter-quality Printer (AF82D)	Price £299.95
Joysticks (AC37S) .... per pair	Price £13.95
Le Stick (AC45Y) .... each	Price £24.95

Join the UK Atari Computer Owners Club, an independent user group. Send £3 to Ron, P.O. Box 3, Rayleigh, Essex SS6 8LR for 4 issues of club magazine. Issue 3 now available. State which issue to start subscription.

The Atari 800XL is unlikely to be available before Christmas, but is in any case no different from the 600 XL except all 64K RAM is built inside box.

Check out our huge range of software for Atari. Ask for our free leaflet XH52G.
★ Maplin are an authorised service centre for Atari ★

POWERFUL CGL M5

The M5 contains one of the most powerful colour video processors available. An incredible 32 sprites simultaneously and 16K of RAM dedicated to graphics alone. Driven by the powerful Z80A main processor, there M5 contains three tone generators and a noise generator all with envelope control like a mini-synthesiser. The M5 comes complete with BASIC, superb handbooks for beginners and lead to connect to almost any standard cassette recorder.

CGL M5 computer (AF64U)	Price £149.95
BASIC G - A BASIC with extended and very powerful graphics commands (KS01B) ...	Price £34.95
Joypads (AF65V) .... per pair	Price £24.95

Lots of new peripherals and software becoming available now. Check with our sales desk for further information.

If your order contains over £120 worth of computer hardware apply now for credit with no extra charges. Telephone: Mail Order: (0702) 552911; London Shop: 01-748 0926; Manchester Shop: 061-236 0281; Birmingham Shop: 021-356 7292; Southampton Shop: (0703) 25831; Southend Shop: (0702) 554000 or write to P.O. Box 3, Rayleigh, Essex. SS6 8LR.
You pay 10% down, then 10% per month for a further 9 months, (to nearest penny). Example: Atari 600XL. Cash price 159.95. Credit terms £15.95 down, then £16.00 per month for nine months. Total £159.95 which equals the cash price.
Credit quotations on request. This offer subject to approval which may take up to 48 hours or more, and is only open to whose who live on UK mainland and are over 18. Please note that we act as credit brokers for this service.

DISKS DISKS DISKS

*** LOWEST PRICES – FAST DELIVERY ***

PRICE PROMISE

We will match any other lower price advertised in the current issue of PCW for single boxes in stock

5.25" DISKS – BOXES OF 10

	PRICES PER BOX 1-4	5-9	10+	QTY	AMOUNT
DYSAN					
104/1 S-side/ S Dens (48tpi 40 Tr)	22.00	21.00	20.00		
104/1D S-side/D Dens (48tpi 40Tr)	24.50	23.00	21.70		
104/2D D-side/D Dens (48tpi 40Tr)	31.00	30.00	29.00		
204/1D S-side/Q Dens (96tpi 80Tr)	33.00	32.00	31.00		
204/2D D-side/Q Dens (96tpi 80Tr)	39.00	38.00	37.00		
VERBATIM DATALIFE (Five year warranty)					
MD525-01-HR S-side/S or D Dens (48tpi 40Tr)	16.00	15.50	15.00		
MD550-01-HR D-side/S or D Dens (48tpi 40Tr)	22.50	21.50	20.50		
MD577-01-HR S-side/D or Q Dens (96tpi 77/80Tr)	22.00	21.00	20.00		
MD557-01-HR D-side/D or Q Dens (96tpi 77/80Tr)	29.00	28.00	27.00		
10 or 16 hard sectors at same price					
Add £1.25 for plastic case					
VERBATIM VEREX (One year warranty)					
MD200-01 Soft Sector uninitialised	14.25	13.75	13.25		
MD200-AS Apple Systems Only	14.00	13.50	13.00		
MEMOREX					
3431-HR S-side/S Dens (48tpi 40Tr)	14.50	14.00	13.50		
3481-HR S-side/D Dens (48tpi 40Tr)	14.80	14.30	13.80		
3491-HR D-side/D Dens (48tpi 40Tr)	19.50	18.50	17.50		
3504-HR S-side/Q Dens (96tpi 80Tr)	23.00	22.10	21.30		
3501-HR D-side/Q Dens (96tpi 80Tr)	25.00	24.00	23.00		
BASF (Qualimetric)					
1X S-side/S Dens (48tpi 40Tr)	14.25	13.75	13.25		
1D S-side/D Dens (48tpi 40Tr)	17.75	17.25	16.75		
2D D-side/D Dens (48tpi 40Tr)	22.25	21.25	20.50		
ACCESSORIES					
HCK5 Head Clean Kit with Fluid	15.90	15.50	15.00		
LC5 5.25 Library cases EGLY	1.90	1.80	1.70		
LB40 Lockable Box 40 Cap inc Disk Pen	14.00	13.50	13.00		
LB85 Lockable Box 85 Cap inc Disk Pen	18.00	17.00	16.00		

8" DISKS — IN BOXES OF 10 DISKS

Phone for most Competitive Price for Verbatim, Basf, Memorex and Accessories

POSTAGE/PACKING (UK)		p & p
5.25" Disks/Clean Kit	£1/Box* (75p/Box 10+)	Total Exc. VAT
Library Case	50p/Box (35p/Box 10+)	VAT 15%
Lockable Box	£2.50/Box (£1/Box 10+)	Total Payable
* Add 30p/Box for 1st Class		

Please contact us for Quantity Discounts (10+ Boxes) and Trade Accounts. Official Orders welcomed.

Name .... Tel. No. ....

Address ....

....

Access/Barclaycard/Cheque No ....

If you do not wish to cut out form send order separately

34 Cannonbury Avenue, Pinner, Middx HA5 1TS

Telephone orders any time – we do the rest – 01-868 9548

Pinner Wordpro

JADE COMPUTERS WOULD LIKE TO APOLOGISE TO ALL POTENTIAL CUSTOMERS WHO SAW OUR AD FOR DRAGON PRODUCTS IN LAST MONTH'S PCW. JADE COMPUTERS NO LONGER HANDLE ANY HOME COMPUTER PRODUCTS AND WE ARE NOW ENTIRELY DEVOTED TO SELLING BUSINESS SYSTEMS.

Xaviersine Software Store has taken over all home computer sales for Jade Computers. Please refer any enquiries to them on the following telephone number:

0761 36509.

XAVIERSINE SOFTWARE STORE
COOMBEND, RADSTOCK,
BATH

jade

Computers for Export

Sinclair
Oric
Commodore
Atari
Texas
Epson
Coleco

BBC
Vectrex
Linx
Aquarius
New Brain
Acorn

Plus Printers, Disc Drives, Memory Expansion, Software

Quantity discounts available

No tax charge for equipment shipped abroad

Write for our price list or call our 24hr answer phone

01-549 8229

Galaset Ltd, 30 Bayford Road, Littlehampton, West Sussex, England. Telex. 8954018 Acurat G

CRYSTAL RESEARCH LTD

CP/M-Z80 SYSTEMS SOFTWARE

Including

OSBORNE, NASCOM, MIMI 803, GEMINI, IOTEC IONA, SHARP MZ80K, A, B, INTERAK 1, Most Z80 CP/M systems, HOMEBREW, etc.

XTAL BASIC 3 FEATURES INCLUDE

1 has over **110** Commands and Functions and is user extendable.

2 **XTAL BASIC 3** incorporates its own editor that is independent of VDU or terminal being used but appears to have the facilities of the most sophisticated direct screen editing, in brief the editor contains the following:
Lines of 127 characters (can be extended up to 254).
Full on screen editing, up, down, left, right.
Auto insertion of Lines.
HOME CURSOR, CLEAR SCREEN, DELETE LEFT, DELETE RIGHT, INSERT CHARACTER, ERASE WHOLE LINE, ERASE TO END OF SCREEN, PRINT SCREEN CONTENTS TO PRINTER and ABANDON LINE.

3 Variables can be of any length. First five characters used to distinguish one variable from another. Multi-dim arrays, string arrays and integer arrays.

4 Full Tape and Disc file handling.

5 32 standard error messages and traps. Ability to trap **BREAK KEYS**. Error table is extendable.

6 Possible to run programs larger than memory capacity using special **CHAIN** and **HOLD** features.

7 **XTAL BASIC 3** is designed to be compatible with most available BASICS and allows transfer of programs from machine to machine via ASCII files.

8 The manual, consisting of over **100 pages**, includes full description of the BASIC, sample programs, useful Machine Code Subroutines in XTAL BASIC 3, examples of extra commands and functions.

9 **SIZE 12K to 14K** depending on the system.

10 Casette **£40.00** + **VAT**. Disc **£60.00** + **VAT**.

OTHER SOFTWARE INCLUDES DATA TRANSFER, CONVERSION D.O.S. etc.
OEM and **MANUFACTURERS** are invited to contact **CRYSTAL RESEARCH LTD** for licence details.

Open 0930-1200 1300-1730 except Saturday & Sunday
40 Magdalene Road, Torquay,
Devon, England Tel: 0803 27890
Access and Barclaycard

XTAL BASIC

FOR THE BBC MICRO ▪ SINCLAIR ZX SPECTRUM ▪ ORIC 1 ▪ DRAGON 32

PAN AND PERSONAL COMPUTER NEWS PRESENT

60 PROGRAMS – £4.95

(LESS THAN THE PRICE OF A SINGLE CASSETTE!)

A new force in computer publishing. You can be sure that these new books which introduce a new range of paperbacks are the best – they're published by Britain's bestselling paperback publisher and the country's most successful and authoritative computer magazine – Pan and Personal Computer News.

The most successful software writers have been commissioned to write a completely new collection of programs for each of the most popular and fast-selling microcomputers. Robert Erskine is a programmer whose software has topped bestseller lists. Humphrey Walwyn is a broadcaster, magazine columnist and experienced software writer.

Not just the same old replays. You'll be amazed how much has been packed into these new books. The emphasis is on games, and versions of the standard arcade classics are included, such as Moonlander, Space Invaders and Pacman. Added to these are other innovative arcade-type games, while less war-like enthusiasts can try Postman, Tug of War or even play the commercial market with Asset-stripper. Other categories among the 60 program listings are board-style and tactical games with words and numbers, and educational and kids games. Useful programs, too, like Holiday Expenses, how to learn about critical path analysis, work out paypackets – and much much more. With around 320 pages these large paperbacks are unbeatable value!

Where can you get them? From all good bookshops. Or fill in the coupon below and return it to

Pan Books Ltd.,
FREEPOST, P.O. Box 109,
14-26 Baker Street,
High Wycombe,
Bucks HP11 2TD.

For immediate 24 hour service 'phone 01-200 0200 and use your credit card.

GET MORE OUT OF YOUR MICRO WITH…

60 PROGRAMS

POST NOW, NO STAMP NEEDED To Pan Books Ltd., FREEPOST, P.O. Box 109, 14-26 Baker Street, High Wycombe, Bucks HP11 2TD.
YES Please send me the following 60 PROGRAMS… paperbacks at £4.95 each plus 35p for the first book ordered plus 15p for each additional book to a maximum charge of £1.25 to cover postage and packing.

name (Mr/Mrs/Miss/Ms) ____________ ☐ BBC Micro ☐ Sinclair ZX Spectrum

address ____________

____________ postcode ____________ ☐ Oric 1 ☐ Dragon 32

I enclose my cheque/postal order for £______ payable to Pan Books Ltd *or* debit my Access/Barclaycard/Visa/Trustcard

no. ____________

Signature ____________

Allow up to 15 days for delivery. This offer available within UK only.

Pan Books Ltd Registered in England Registration No. 389591

PERSONAL COMPUTER NEWS LIBRARY

PCN

NEW HOME COMPUTER CABINET

SPECIAL OFFER

£79.95
incl. VAT & Delivery

Especially designed for your home computer system, whilst also accommodating your video recorder.

Our cabinet has been custom designed after intensive consultation with P.C. users to provide maximum comfort and convenience during those long hours spent slaving over a hot micro.

The cabinet includes many features not previously available, and as well as combining the very best aspects of modern furniture design, it provides an ergonomic and practical layout for all the major components of your system.

In fact, we are proud to claim that your cabinet will look perfectly at home in your lounge, dining room, or even bedroom.

JUST CHECK THESE STANDARD FEATURES

1. Smooth sliding shelf locks in position just where you require it — and neatly glides away after use.
2. The computer shelf has been designed to allow adequate 'Knee room' for you to sit comfortably, and will avoid 'programmers backache'.
3. Adequate room to position tape recorder, printer, disc-drives, etc, alongside computer for ease of use.
4. All cables neatly and safely out of sight, while allowing all units to be permanently connected if desired.
5. Lots of storage space for cassettes, cartridges, books, listing paper, joysticks, etc.
6. With shelves and doors closed, instantly becomes an elegant piece of furniture.
7. The lower shelf accommodates all makes of video recorders currently available.
8. Smart teak effect finish.
9. Supplied as a flat-pack. Very simple to assemble, using just a screwdriver. Full instructions supplied.
10. Measurements: Height 32½ins, Width 36ins, Depth 16¾ins.

TERMS OF OFFER UK Mainland Customers only. Please allow up to 28 days for delivery. Cash with order or charge to one of the credit card accounts specified. Money back guarantee if not satisfied provided the goods are returned undamaged within 72 hours of the customer taking receipt.

ORDER FORM

Please send me one of your Home Computer Cabinets as advertised. I enclose my cheque for £79.95 or please debit my

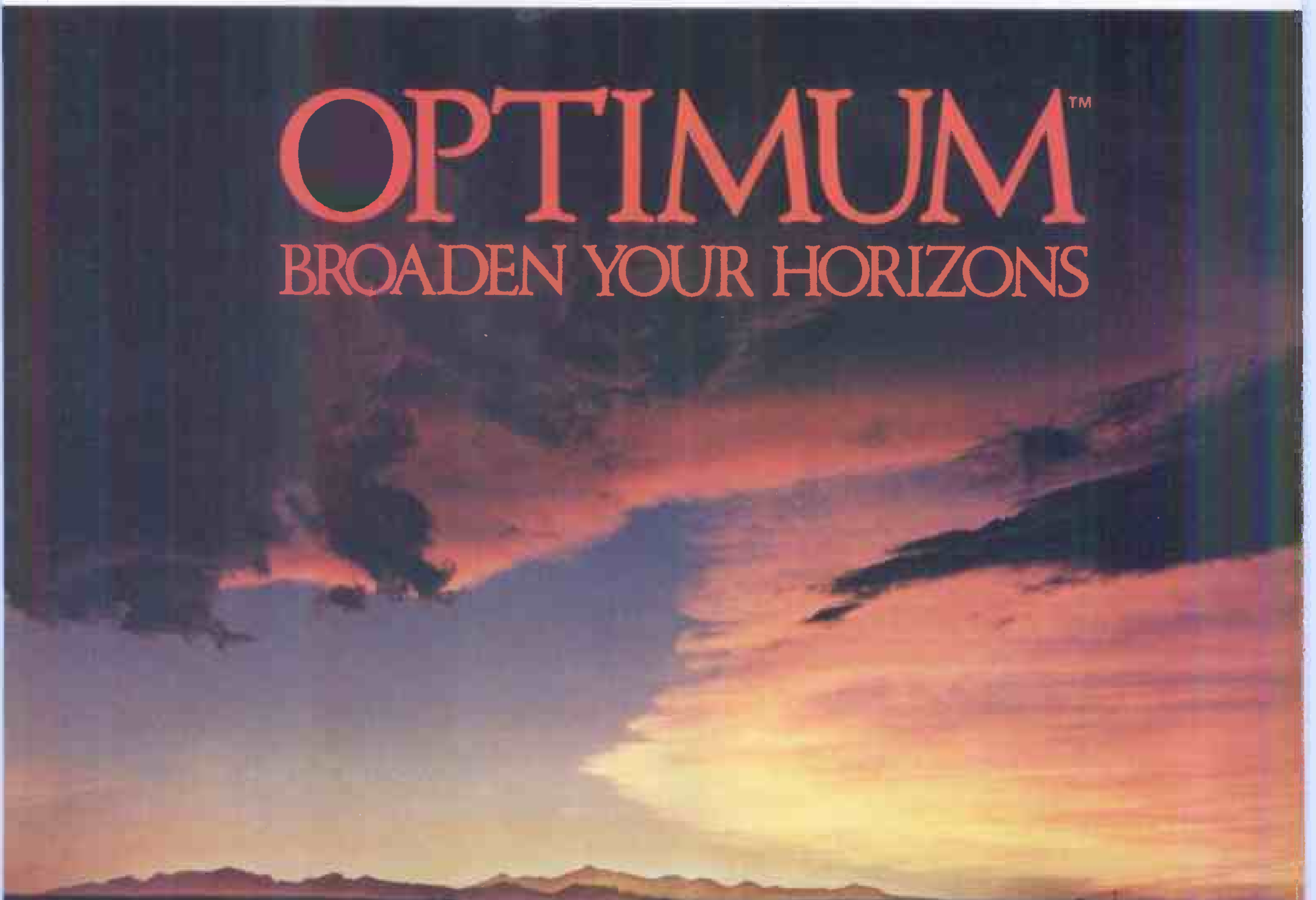
Access/Barclaycard No.................................. Name (Block letters)..................................Signed..................................

Address..

....

....

MOUNDPORT LIMITED, 151 ALBERT ROAD SOUTH, SOUTHAMPTON SO1 1GB



Uveon proudly announces OPTIMUM for the Rainbow. OPTIMUM, a state-of-the-art data management system already well established in the 8 bit CP/M world, now operates under CP/M-86, MSDOS, and PCDOS. Breaking through micro-computer DBMS barriers, OPTIMUM provides flexibility, practicality, and programming power to broaden your data management horizons. Developed for individual computer users and applications builders, OPTIMUM provides a unique combination of features which include user defined files and screens, multi-user processing with record locking, variable length data storage, keyed direct data access, ad-hoc inquiry and reporting, and a powerful information cross-reference system.

USER-DEFINED FORMS AND FILES

With OPTIMUM, implementing an application is simple. The user merely describes the contents of a file and the system does the rest. OPTIMUM builds the programs, the files, and the dictionaries required to allow data entry to begin immediately. If the need exists, OPTIMUM can handle complex or multiple screen forms for the same file. These created programs may be modified or enhanced, and the screens may be customized, as required.

DICTIONARIES

OPTIMUM maintains a dictionary for each file. This dictionary describes each field in the file and instructs OPTIMUM about any special processing required. Alterations and additions to dictionaries may be easily made to add computed fields, file lookups, etc.

MICRO-ENGLISH REPORTING

OPTIMUM Micro-ENGLISH lets the user request standard or custom reports from the OPTIMUM files. Sophisticated selecting and sorting capabilities give Micro-ENGLISH all the power of a large scale interactive inquiry processor.

OPTIMUM STORAGE EFFICIENCY AND SPEED

OPTIMUM stores all file information in a compact variable-length format. OPTIMUM files are designed for interactive speed; a single file item may be retrieved from among thousands in an instant. Any subset of a file may be selected, sorted, processed, or displayed using Micro-ENGLISH.

OPTIMUM CROSS-REFERENCING

A unique feature of the OPTIMUM system allows a user to specify cross-referenced data fields. Once information is entered, it may be retrieved simply by using key words from these fields.

From simple applications to complex systems, OPTIMUM manages it all!

Broaden your horizons with OPTIMUM by Uveon.

For more information about OPTIMUM, call or write: Uveon Computer Systems, Inc., 899 Logan St., Denver, CO 80203, (303) 831-7000.

Uveon Computer Systems, Inc.
899 Logan Street
Denver, CO 80203

A leading-edge software company with products and personnel that meet the needs of a rapidly growing micro-computer industry.

UVEON
The Future in Software.

CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost.
These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums.
e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit. Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited.
Some computers, however, have the advantage of both games facility plus the whole world of computing to explore, as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi-Technology world, and help earn its keep with its added uses in the field of education, communication and home business use.

SOFTWARE

Make sure the system you choose has a growing library of support software, to enable you to realize the full potential of your machine.

KEY POINTS TO LOOK FOR

High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35,000, then the graphics can hardly be considered high resolution. Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance.

High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects; very important for generating music. Also look for the ability to connect to external amplifiers.

Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications; very important if the purpose of purchasing a computer is educational.

RAM

One of the most important features of a computer is the amount of RAM, or memory, included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU.
If it is less than 32K think again, is it enough?

Computer Language

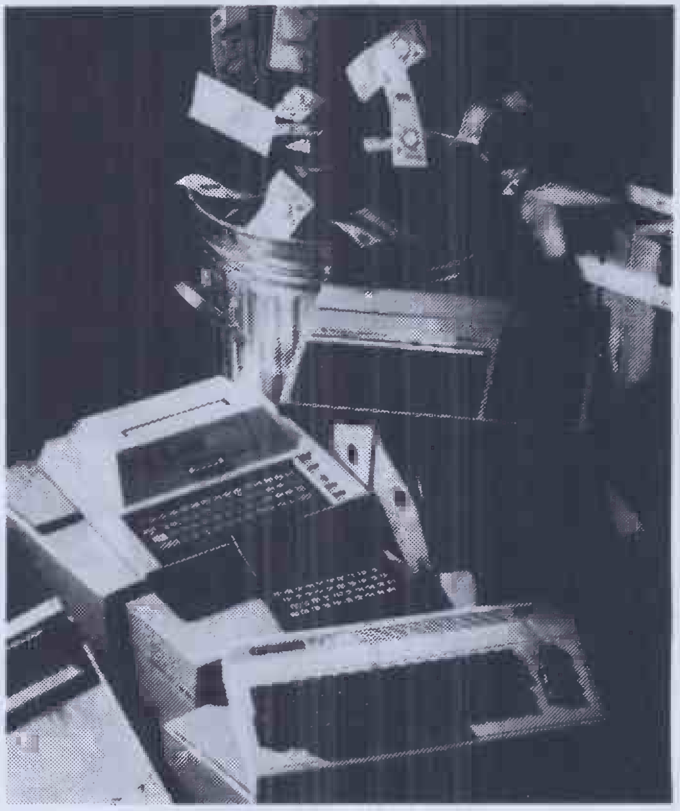
It is too dificult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However, there are a number of BASICs, some being very different from the rest.
A de facto standard in the computer industry is Microsoft BASIC.
Learn this one and you will be able to program in the majority of computer BASICs; such an important point if a home computer is to be used to educate your children to face the technology of the future.

Expansion

As your interest and knowledge of computing grows, you will need a computer system that will grow with you; able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor, as well as produce HI-FI sound effects.

Software

The computer you choose should have a growing selection of utility software to make the most of its capability.
Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer.
In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.



Choosing the right system carefully will save you from throwing your money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.

To find out which company offers you the right choice, with:-

- Good value, high specification, quality micros.
- A quality, 4 colour, plain paper printer/plotter.
- Communications Modem.
- Micro Disk Drives.
- Comprehensive and growing range of software

TURNOVER...

HELL'S TEMPLE POSTERS AVAILABLE SEPERATELY @ £2.50

A MEAN, FAST ACTION ADVENTURE ON ORIC-1 WHERE COURAGE AND A STRONG SWORD ARM RULES

Hells Temple is one of the most advanced Adventure programs for the Oric-1.

With over 70 monsters to battle, Hells Temple represents the state of the art for other adventure programs to follow. This complex and exciting scenario is acted out between those immortal ones of Satan and those who are brave enough to enter Hells Temple. This is the place where only courage, sorcery and a strong sword arm rules.

"It is the time of the dark ages when only witchcraft, sorcery and fear ruled mankind. During these dark years there roamed across the land adventurers who sought riches and power. These men were a strong and gallant breed who fought against the powers of evil for rich rewards or their destruction. Armed only with a strong sword arm, a little magical power and courage, these men would seek to conquer where most men feared to tread, deep within the Devil's lair."

You are one of these brave and gallant mercenaries of action whose task it is to seek out the riches that lay within the Temple and to battle with the agents of darkness that dwell deep within the catacombs.

HE WHO ENTERS THE TEMPLE IS A FOOL!!

PARENTAL GUIDANCE RECOMMENDED FOR CHILDREN UNDER 16 YEARS

COMBAT
BRIBERY RETREAT
HIRES COLOUR GRAPHICS
OVER 70 MONSTERS
CHARACTER SAVE FACILITY
PROWLING MONSTERS
REINCARNATION
SPELLS

Kenema Associates Ltd.
1 Marlborough Drive
Worle, Avon, BS22 0DQ
Telephone: (0934) 510279

£12

AVAILABLE SOON FOR:
BBC
ELECTRON
COMMODORE 64
SPECTRUM
DRAGON
LYNX
VIC 20
& OTHERS.

ADVENTURERS WANTED FOR A MEAN, FAST-ACTION ADVENTURE - WHERE ONLY COURAGE AND A STRONG SWORD ARM RULES

35% Off

ORIC-1

ORICSTAR £12.00

Word processing on your Oric is easy with Oricstar. Full Screen Editing, String Search and Replacement, Full Printer Support, Word Wrap, Document File, Mailshot retrieval System. For small businesses or personal applications. Extravagant word processing at a budget price.

ORIC FILESTAR £12.00

A powerful Database system with Dual Dimensioned Arrays for Records Creation, Search and Retrieval. Menu Driven Options include Create New File, Save/Load Files, Record Search, Column Search, Sort Files, File Management. Printer Options. Suitable for small business applications, product files, personnel files, etc. Complete with operating instructions.

ORIC EXTENSION MONITOR £15.00

Turn your Oric into a Machine Code orientated system with this superb Machine Code Extension Monitor. Containing a host of facilities not found on other monitors of this type. Hex and Dissassembler Listing, Memory Modify, Program Relocator, Memory Move and Fill, Breakpoint Set, Eliminate and Display. Register Display and Modification. User Command and Printer Routine. Hex and Decimal Arithmetic with Overflow and Remainder & Last' Result. Character and Byte String Searching Facilities. Ideal for the creation and debugging of your Machine Code programs. The programmer will like this one. Complete with instruction manual.

AWARI £5.50

Play this popular game at Witch Doctor level with the whole family or friends. With Colour Graphics and Sound this ancient African game comes alive on your Oric.

DESIGN AID £5.50

Design your own Characters or Graphics on the Oric-1. This super program displays enlarged and real size to be modified or designed at will with full editing. Copying and Data Readout. Fully Menu Driven. Make computing on your Oric a little easier with this easy-to-use Character/Graphics processor.

KEY TRAINER £5.50

Teach yourself keyboard control and how to type on your Oric. Menu driven, this program provides useful exercises for the complete novice. A must for beginners or one-fingered jockeys.

OTHELLO £6.50

The famous board game on your Oric1. Hi-Res Colour Graphics and Sound. Requires patience and skill. Play a friend, or let your Oric play itself.

50% DISCOUNTS FOR TANGERINE USERS GROUP MEMBERS....LARGE S.A.E. FOR DETAILS.

DON'T FORGET OUR RANGE OF HARDWARE FOR YOUR ORIC-1...SEND S.A.E. FOR LIST.

AVAILABLE AT ALL GOOD SOFTWARE OUTLETS WORLDWIDE!!!

DEALER ENQUIRIES WELCOMED - GENEROUS DISCOUNTS GIVEN.

***** SAVE £££££'s *****
LAUNCH DISCOUNTS OFFER ON ALL SOFTWARE!!!

DON'T FORGET TO DEDUCT 35% FROM THE TOTAL!!

PROGRAMMABLE

SYSTEM POWER SUPPLY INDEPENDENT

BE THE ENVY OF ALL YOUR FRIENDS

YOU'LL BE AMAZED

VOICE

USES A VERY POPULAR ALLAPHONE (EXTENDED PHONEME) PROCESSOR

SYNTHESISER

EVERY GOOD COMPUTER SHOULD HAVE A VOICE OF ITS OWN

FOR

MAKE YOUR COMPUTER COME ALIVE!

MAKE YOUR PROGRAMS COME ALIVE!

MICROTAN 65 + ORIC-1

& OTHER MICROS

WITH A STANDARD CENTRONICS PARALLEL PRINTER INTERFACE !!!

THIS IS THE OPPORTUNITY YOU'VE BEEN WAITING FOR IDEAL FOR GAMES HOME BUSINESS INDUSTRY APPLICATION AND MANY OTHERS LIKE TALKBACK SYSTEMS AS USED IN EDUCATION AND REPONSE SYSTEMS!

NOW YOUR COMPUTER CAN TALK BACK TO YOU WITH A PROGRAMMABLE VOICE USING THE VERY POPULAR ALLAPHONE SYSTEM TO GIVE YOU UNLIMITED VOCABULARY IN ALL LANGUAGES MAKING YOUR PROGRAMS AND COMPUTER REAL!

HI FI CONNECTION FOR EVEN GREATER SOUND VOLUME

ONBOARD MONITOR SPEAKER

INTRODUCTORY OFFER
PRICE 29.95 INC
ADD £1.00 p.p

NEW

* MANUAL (AVAILABLE IN FOREIGN LANGUAGES)

FROM THOSE AWFULLY NICE SOFTWARE PEOPLE!!!

ALL SOFTWARE NOW AVAILABLE EX-STOCK

PLEASE ADD 50p p&p.

CREDIT CARD HOTLINE/ 24 Hr. DISPATCH (0934) 510279

ALL MAIL ORDERS TO:-

Kenema Associates Ltd.
1 Marlborough Drive
Worle, Avon, BS22 0DQ
Telephone: (0934) 510279

DON'T FORGET - YOU CAN ALWAYS ORDER ON THE TELEPHONE WITH YOUR CREDIT CARD.

VISA

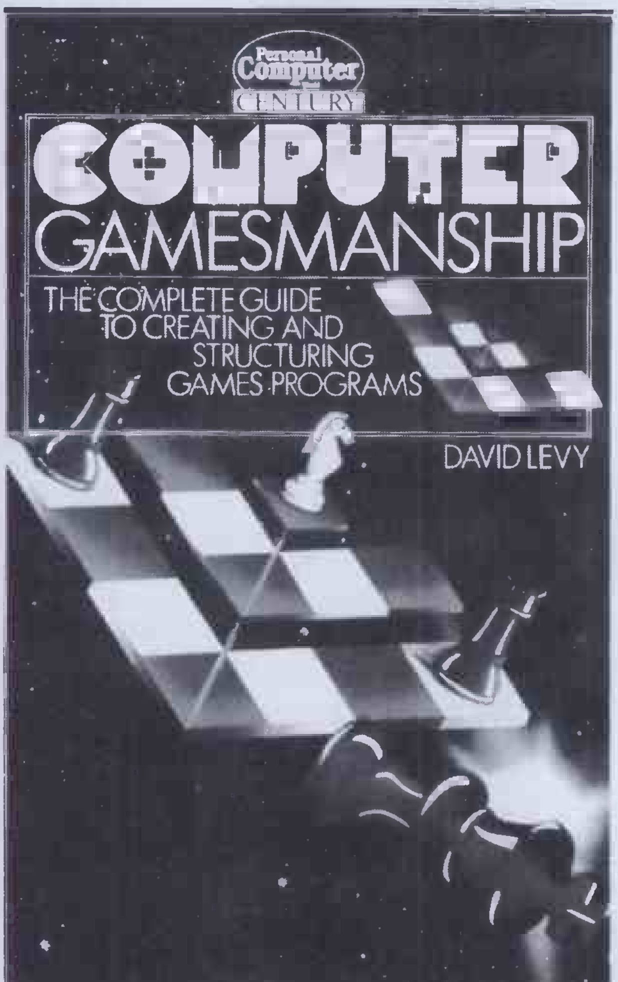
Access

ORIC 1

M/CODE SOFTWARE WRITERS WANTED FOR PROGRESSIVE EXPANDING SOFTWARE COMPANY FULL TIME - FREELANCE- RING FOR DETAILS.

Personal Computer World
CENTURY

For all personal computer owners interested in writing intelligent games programs



COMPUTER GAMESMANSHIP

The Complete Guide to Creating and Structuring Games Programs

DAVID LEVY

Computer Gamesmanship is not another collection of program listings, but a rich sourcebook of the techniques, strategies and logic of intelligent games programming.

272 pages £7.95 (paperback)

Available through all good bookshops or if you experience any difficulty please fill in the form below.

ORDER FORM

To: Department CPI
George Philip Services Ltd
Arndale Road
Wick, Littlehampton
West Sussex BN17 7EN

Please send me__________copy/copies of COMPUTER GAMESMANSHIP by DAVID LEVY at £8.45 per copy (post paid)

I enclose my cheque/postal order for £________
(Please make payable to George Philip)

Name__________

Address__________

Please allow up to 28 days for delivery

CENTURY

YOU HAVEN'T SEEN ANYTHING LIKE THIS ON A COLOUR MONITOR BEFORE.

An RGB monitor from JVC offering a resolution of 370 x 470 pixels for less than £150?

We guarantee you won't see another bargain like that in this or any other micro mag – or in any other supplier's showroom.

For we've managed to acquire the sole distribution rights to these superb machines and we are able to offer them at an unbeatable price.

There are two models available: medium resolution (370 x 470 pixels) at £149.95; and high resolution (580 x 470 pixels) at £229.95. (Both excluding VAT.)

The units have a 14" screen and are suitable for the BBC Micro, Lynx, Oric, Apple, IBM and most other leading micros.

They are robustly constructed in a handsome cream casing. And come with a full year's guarantee.

Delivery is good: your monitor should arrive by courier service within ten days of our receiving your order.

You can order by filling in the coupon below and posting to: Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE. Or by telephoning 01-701 8668 quoting your credit card number. Or, of course, you can buy in person at our showroom between 9-5.30 pm, Monday-Saturday.

MODEL REFERENCE	1302-1 Medium Resolution	1302-2 High Resolution
RESOLUTION	370 x 470 Pixels	580 x 470 Pixels
C.R.T.	14"	14"
SUPPLY	220/240v. 50/60Hz.	220/240v. 50/60Hz.
E.H.T.	Minimum 19.5kv Maximum 22.5kv	Minimum 19.5kv Maximum 22.5kv
VIDEO BAND WIDTH	6MHz.	10MHz.
DISPLAY	80 characters by 25 lines	80 characters by 25 lines
SLOT PITCH	0.63mm	0.41mm
INPUT: VIDEO	R.G.B. Analogue/ TTL Input	R.G.B. Analogue/ TTL Input
SYNC	Separate Sync on R.G.B. Positive or Negative	Separate Sync on R.G.B. Positive or Negative
EXTERNAL CONTROLS	On/off switch and brightness control	On/off switch and brightness control

To Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE.

Please send me ______ Medium Resolution Colour Monitor(s) at £149.95 each (ex. VAT).

______ High Resolution Colour Monitor(s) at £229.95 each (ex. VAT).

______ Connection lead(s) at £6.00 each.

I understand carriage per monitor will cost an extra £7.00.

(N.B. A Medium Resolution Monitor including VAT, lead, and carriage costs £187.39. A High Resolution Monitor including VAT, lead, and carriage costs £279.39.)

I enclose a cheque for £ ______ Or please debit my credit card account with the amount of £ ______ My Access/Barclaycard (please tick) no. is ______

Name ______

Address ______

PCW 1

______

Telephone: ______

Opus.
Opus Supplies Ltd.

DTI BULLET

CP/M PLUS — THE LATEST CP/M

When you test the DTI BULLET for yourself, you will discover that, under CP/M, it simply outperforms most 16-bit micros on the market. The DTI BULLET not only opens up for you the vast array of CP/M* compatible application software, but will offer you multi-user capability via MP/M* and networking. Education, scientific, research, or business, you will find the exciting DTI BULLET gives you more opportunities for your money.*

SPECIAL PRICE UNTIL 30.11.83 **£1,500**

DTI BULLET at a glance:

- Z80A Processor running at full 4MHz
- 128 KByte RAM standard
- Twin bi-directional RS232 ports
- Centronics parallel printer interface
- On-board floppy disk controller —
  - — up to 4 drives
  - — supports 5¼in or 8in diskettes
  - — single/double sided
  - — single/double density

  Packaged with 2 double side/density 5¼in drives giving 800KB on-line storage
- Winchester disk interface
- Built-in power supply
- Software: Supplied complete with CP/M* Version 3 operating software licence,

Includes **T/MAKER III**
word-processor
spreadsheet organiser
list processor
file-handler

together with a comprehensive manual and demonstration programs

DTI SYSTEM B NEW FOR BBC AND OTHER MICRO USERS

Incorporating:
12" P31 Monitor
and
1 5.25" 400 KB Drive-System B 1
2 5.25" 400 KB Drive-System B 2
or
12" Colour Monitor
as above System BC 1 or BC 2

Priced
System B 1 **£455**
System B 2 **£695**
System BC1 Price on application
System BC2

DISK DRIVES

6106 MINI 5.25" ⅔ HEIGHT, S/S, 40 TRACK, 250 KBYTES **£170**
6108 MINI 5.25" ⅔ HEIGHT, D/S, 40 TRACK, 500 KBYTES **£190**

6118 1Mb 5.25" DRIVE FOR BBC MICRO £200

POWER SUPPLY AND PACKAGING ADD £65

DISKETTES

	10 PACK £
FLEXY DISKS 5.25" S/S, S/D, 40 TRACK	17
FLEXY DISK 5.25" S/S, D/D, 40 TRACK	19
FLEXY DISK 5.25" D/S, D/D, 40 TRACK	21
FLEXY DISK 5.25" 2/HD, S/S, S/D, 80 TRACK	24
FLEXY DISK 5.25" 2/HD, S/S, S/D, 80 TRACK	29

	10 PACK £
FLEXY DISK 8" S/S, S/D, 77 TRACK	17
FLEXY DISK 8" S/S, D/D, 77 TRACK	19
FLEXY DISK 8" D/S, S/D, 77 TRACK	21
FLEXY DISK 8" D/S, D/D, 77 TRACK	24

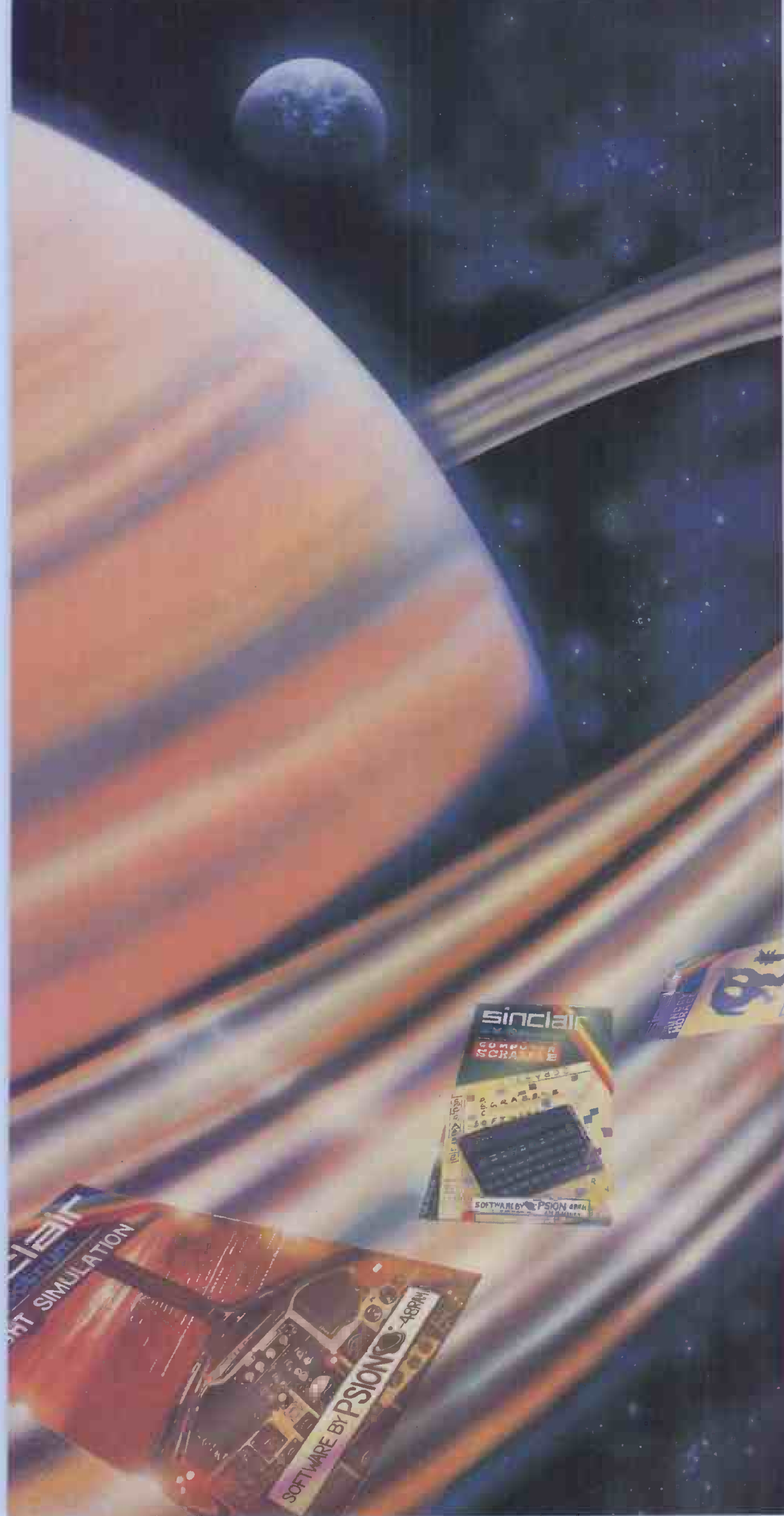
V.A.T. NOT INCLUDED

dti *PRINCE GROUP*

DTI EUROPE LIMITED
10 CRONIN COURTYARD, CORBY, NORTHANTS NN18 8AY.
Tel: Corby (0536) 201152 Telex: 342618 Hamlet G.

Prince Reprographic Ltd.
LOMBARD HOUSE, GREAT CHARLES STREET, BIRMINGHAM B3 3LP
Telephone: 021 233 2286

THE BEST SOFTWARE ON EARTH COMES FROM PSION.



Psion is the source for the best software programs you'll ever see on a Sinclair Spectrum.

Our range runs rings round other software. In short, it's faster, livelier and more colourful.

Why?

Ideas. At Psion, they're bigger and more ambitious.

We combined a 12,000-word dictionary with complex logic – and the result is spectacular: our Computer SCRABBLE® program. Then there's the 'Horace' series...

It's all down to programming skill. Flight Simulation – a 'real-time' program – is a special breakthrough in this field. Few other programs make such full use of your Spectrum's capabilities.

In all, there are 12 challenging titles, published exclusively under the Sinclair label. (Not counting the free 'Horizons' cassette that introduced you to your computer.)

Psion programs for the Spectrum:

- Flight Simulation (48K)
- Chess (48K)
- Space Raiders
- Planetoids
- VU-CALC
- VU-FILE
- VU-3D (48K)
- Hungry Horace
- Horace and The Spiders
- Horace goes Skiing
- Backgammon
- Computer SCRABBLE® (48K)

'Horace' series produced in conjunction with Melbourne House. SCRABBLE® trademark and copyright licenced by Scrabble Schutzrechte und Handels GmbH – a J. W. Spear and Sons PLC subsidiary.

Unbelievable? A recent W H Smith chart of best-selling Spectrum programs speaks for itself. No less than 7 of the top 12 cassettes are by Psion. And there's more to come. Watch out for our very latest program, 'Chequered Flag.'

In fact, if you're choosing software for your Spectrum, there's just one way to find the best...

Look for the Psion symbol on the cover of the cassettes.

PSION

OKI rules, OK!

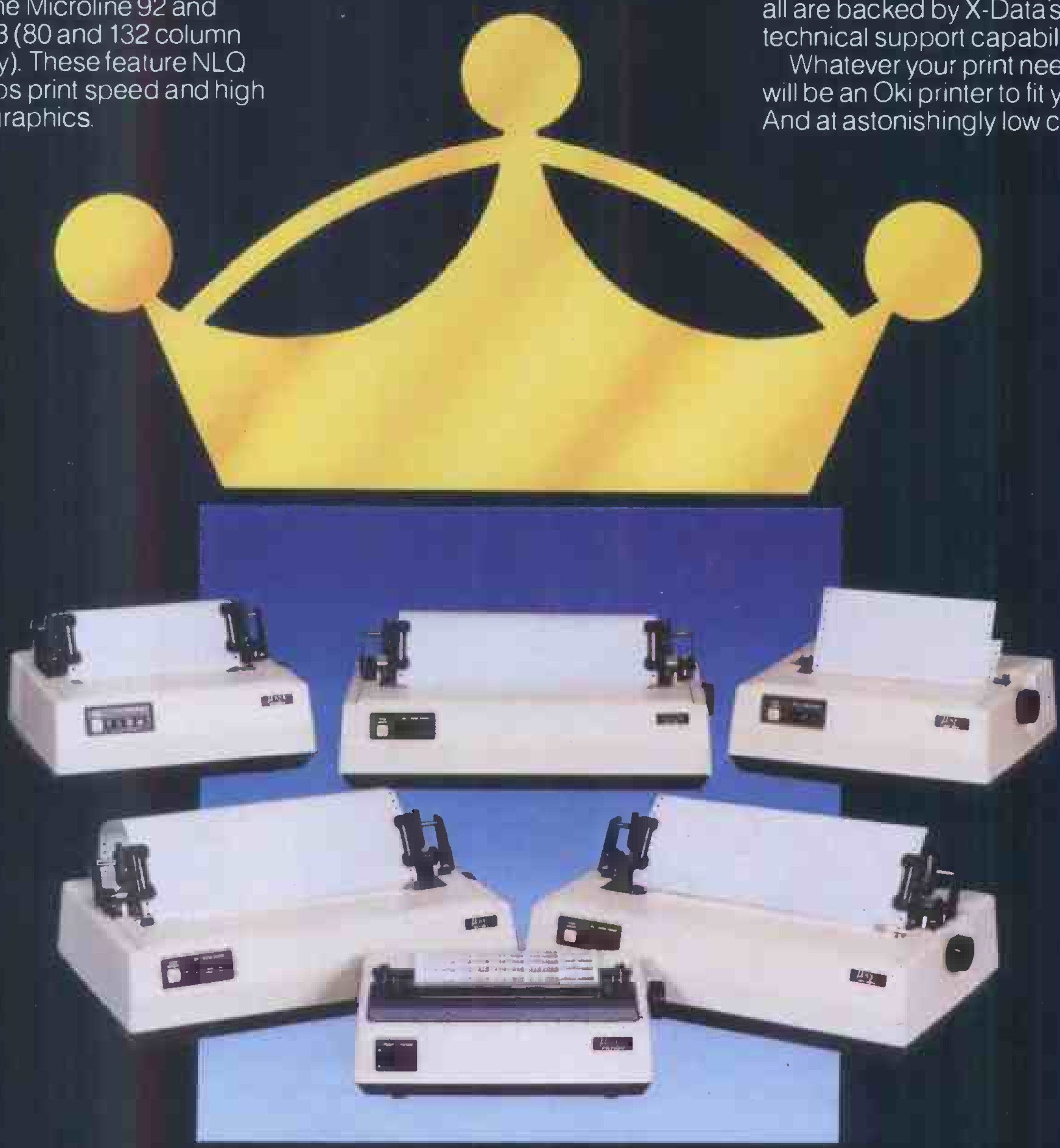
Quality, reliability and unbeatable price/performance are the hallmarks of the Oki Microline family. The only truly complete range of low-cost printers.

Exciting recent additions to the family are the Microline 92 and Microline 93 (80 and 132 column respectively). These feature NLQ print, 160 cps print speed and high resolution graphics.

With these additions the family covers the broadest possible range of capabilities. From the small but very efficient 80-column, 80 cps Microline 80, to the top-of-the-range Microline 84. This sophisticated and professional machine offers speeds up to 200 cps, NLQ print and pin-addressable graphics.

All Microlines are made to Oki's exacting quality specifications, and all are backed by X-Data's high-level technical support capability.

Whatever your print needs, there will be an Oki printer to fit your bill. And at astonishingly low cost.



X-DATA

The authorised OKI distributor

For more information telephone Slough (0753) 72331

X-Data Limited, 750-751 Deal Avenue, Slough Trading Estate, Slough, Berks. SL1 4SH.

· VALUE · APPLE · VALUE ·

INTELLIGENT TERMINALS

INTRODUCTORY PROMOTION
£480.00 + £72.00 VAT

This terminal exceeds TV 925 specification and has full ergonomic swivel and tilt housing, low profile detached keyboard, programmable function keys, intelligent printer port, antiglare green phosphor 14" screen with full video attributes and business graphics. Attributes do not use a character space. 90 day warranty. Nationwide service through the largest third party maintenance group in the UK.

MONITORS

£75.00 + £11.25 VAT

12" Green 18 Mhz monitor in elegant plastic case.

APPLE ADD-ONS

80 COLUMN CARD CPA 4
£57.50 + £8.62 VAT
80 characters by 24 lines with true decenders. 7 x 9 character resolution compatible with BASIC, PASCAL and CP/M. Modem compatible.

Z80 CARD CPA 3
£47.99 + £7.19 VAT
Adds a Z80 processor to your Apple. Under CP/M, you can add COBOL, FORTRAN or BASIC compiler and assembly language to your II plus and run CP/M packages such as Wordstar and business software.

16K RAM LANGUAGE CARD CPA1
£57.50 + £8.62 VAT
Expands the internal memory of your II to 64K and memory capacity available to Z80 card users from 44K to 56K. Available to load integer BASIC under DOS 3.3.

PAL CARD CPA 7
£79.00 + £11.85 VAT
Display your II plus colour text and graphics on your home television

INTEGER CARD CPA 2A
£57.50 + £8.62 VAT
For access to a library of programs in integer BASIC. With any length variable names, strings to 255 characters, auto-line number mode, debug commands.

FORTH CARD CPA 2
£57.50 + £8.62 VAT
Runs the increasingly popular FORTH language on your Apple II or II plus.

RS 232 CARD CPA 12
£57.50 + £8.62 VAT
Permits basic control of high speed printers and plotters. Programs easily with switch selectable preset for speed, line length, auto line feed and carriage return delay. Handles half duplex communications from 75 to 19200 baud. EIA RS 232 C or 20 mA current loop.

PRINTER INTERFACE CARD CPA 9
£38.32 + £5.75 VAT
Parallel printer interface.

APPLE DRIVE ADD-ONS

DISK INTERFACE CPA 6
£47.90 + £7.19 VAT
To connect Apple or compatible drive

DISK DRIVE CPA 14
£176.00 + £26.25 VAT
Top quality Japanese slimline drive with cable.

BASE UNITS

£349.00 + £52.35 VAT

BASE 64A compatible with Apple cards and software. RAM based system control program, 64K on board memory, expandable to 192K. MINI-WRITER on board in RAM. 24K system memory. Tiny assembler with assembly and disassembly function. Upper and lower case characters. Function commands on keyboard. Numerical and cursor keypad. Can load 140K diskette program to 192K user RAM. Staggering value!

TO ORDER:

Send exact amount including 15% VAT plus £7.00 carriage and insurance, quoting part numbers, to:

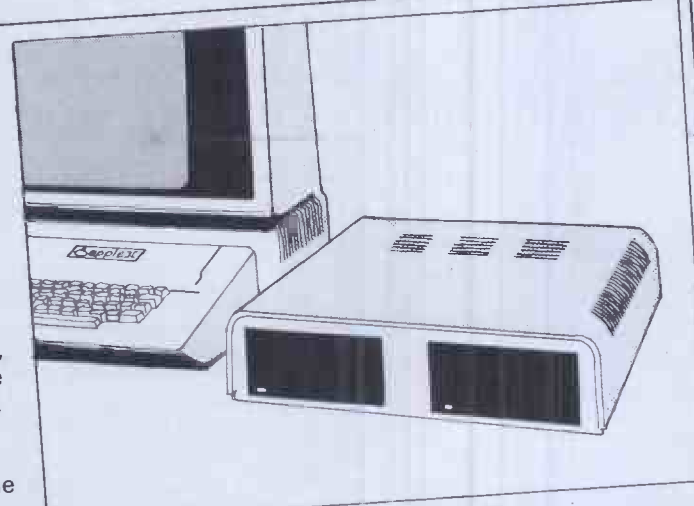
· WOLFCROWN ·

101 Jermyn Street · London SW1Y 6EE · Telephone: 01-930 1991

ATTENTION ALL apple USERS!

MEGAFILE

At last the Hard Disk Sub System at Floppy prices!



If a 140K floppy limits your capacity and hard disk prices are a bit tough then you have been looking for **MEGAFILE**.

Original hard disk systems for Apple were large, noisy and expensive. Many manufacturers have cut down on the size and noise, now **MEGAFILE cuts the cost.**

MEGAFILE is a floppy lookalike which allows the user to run DOS, PASCAL, CP/M systems—even all three together—without changing a single command. Why bother with a back up device when you can buy larger capacity drives at **"Low cost per Bite prices"** and use the extra low cost capacity to backup your important data. Drives set up as 5 + 5 and 10 + 10 will allow you to backup information at the touch of a button with the reliability of **Winchester technology**.

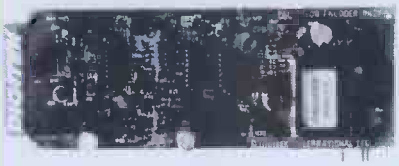
MEGAFILE comes in 5MB, 10MB, 20MB, 5 +5MB, and 10+10MB versions. Complete sub system prices start at £895 dealer enquiries welcome.

For more information contact: MEGATEK
6, SULINA ROAD LONDON SW2 4EL TELEPHONE 01 674 5696

LOOK! . . . FOR ALL YOUR apple

CONTACT THE FRIEND

All items fully guaranteed for one year · Immediate delivery · Free postage and pa



DIGITEK COLOURCARD
This amazing card gives high quality colour and includes a wide band modulator, simply plug in your TV or Pal monitor. £79.00 + VAT.

SEIKOSHA GP700A COLOUR PRINTER
This printer can produce seven primary colours and thirty shades of colour at a print speed of 50cps. £415 + VAT.

THE BIT STIK GRAPHICS SYSTEM
A large smooth tracking hemisphere with adjustable back pressure, and probably the most powerful Microcomputer graphics software available. £245 + VAT.

BUSINESS SOFTWARE	NET	INC. VAT
Advanced Visicalc IIe	195.00	224.25
Business Forecasting Model (Reqs. Visicalc)	69.00	79.35
Calcstar (CP/M) (80 column spread sheet)	69.00	79.35
dBase II (CP/M)	325.00	373.75
Oata Star (CP/M) (powerful data entry)	122.00	140.30
Oata Perfect	67.00	77.05
O.B. Master (version 3.02)	119.00	136.85
D.B. Master statistics	62.00	71.30
D.B. Master utilities (links with visi's)	62.00	71.30
Desk Top Plan II	89.10	102.35
Outil (for dBase II)	65.00	74.75
Graphmagic (bar graphs, pie charts, etc)	59.00	67.85
Mathemagic	59.00	67.85
Msort-80 (stand alone CP/M sort)	125.00	143.75
Multiplan (Microsofts superior spreadsheet)	155.00	178.25
Omnis 64K (also for IIe)	245.00	281.75
PFS Filing system (also for IIe)	68.00	78.20
PFS Graph (also for IIe)	68.00	78.20
PFS Report (Also for IIe)	53.00	60.95
Quick Code (for dBase II)	189.00	217.35
Quickfile (IIe only)	60.00	69.00
Sidevise (prints visi sideways)	40.00	46.00
Supersort (CP/M)	99.00	113.85
The General manager (ver 2.0)	135.00	155.25
The Last One (programme generator)	185.00	212.75
Versaform (form generator in Pascal)	192.00	220.80
Visicalc II + or IIe version	135.00	155.25
Visi + (visicalc consolidation)	19.45	22.37
Visicalc utilities	34.00	39.10
Visidex	135.00	155.25
Visifile	135.00	155.25
Visiplot	135.00	155.25
Visitrend/plot	155.00	178.25

WORD PROCESSING	NET	INC. VAT
Applewriter IIe	115.00	132.25
Applewriter II	83.00	97.75
Executive Secretary	149.00	171.35
Executive Speller	49.00	56.35
Format 80	129.00	148.35
List Handler (Mailer & Form Letter)	69.00	79.35
Pie Writer (40/80 columns)	87.00	100.05
Sensible Sneller (multi-version)	69.00	79.35
Screenwriter II (70 col w/out 80 col card)	75.00	86.26
Super Text 40/80	114.00	131.10
Word Handler (does not req. 80 col. card)	99.00	113.85

Wordstar (CP/M)	220.00
Zardax (40/80 & inc form letter)	139.00
PRINTERS	
Epson RX-80 FT	325.00
Epson FX-80 (160 cps & prop. spacing)	399.00
Epson MX100FT-3	449.00
Mannesmann Tally MT160	599.00
Seikosha GP700A (col printer)	415.00
Sweet P Plotter	585.00
Nec 8023 (120 cps & prop. spacing)	319.00
Tec Starwriter F10-40cps	1099.00
PRINTER INTERFACE CARDS	
Aristocard Parallel	69.00
Aristocard Serial	75.00
Asynch Serial I/Face (7710A)	119.00
Buffered Grappler	175.00
CPS Multifunction Card (inc clock)	139.00
Digitek Printmaster (BASIC/CPM/PASCAL)	69.00
Grappler + (Epson/Anadex/Cent/Nec)	98.00
IPB-16K (serial/parallel card & buffer)	129.00
MBP-16K (Epson 16K buffer)	96.00
80 COLUMN CARDS & ACCESSORIES	
Ramview 80	69.00
Ramview 80 + 64K	115.00
Softswitch (for Videx Videoterm)	24.95
U-Term (inc shift mod. & font editor)	127.00
Ultraterm (new Videx card)	285.00
Videx Enhancer II	83.00
Videx Inverse Eprom	18.45
Videx Utility Disc (inc font editor etc)	27.00
Videx Videoterm	175.00
Visicalc preboot disc (80 col with videx)	32.00
Vision-80 (incs softswitch & inverse)	185.00
MONITORS/COLOUR CARDS	
Digitek Colour Card	79.00
D.M.S. R.G.B. Colour Card	88.00
Kaga 12" Green Screen	105.00
Microvitec colour monitor	265.00
Microvitec colour card (use with above)	35.00
Zenith 12" Green screen	89.00
GRAPHIC UTILITIES & MUSIC	
Arcade Machine (game designer)	42.00
Bit Stik (Robocom)	245.00
Complete Graphics System (Penguin)	65.00
Digitizer II	189.00
E-Z Oraw 3.3 (excellent graphic utility)	32.00
Gibson Light Pen	245.00

ROSETTA
Rosetta is a utility that allows the transfer of Pascal files to Applesoft DOS and 'vice-versa', it also allows the writing of Applesoft or assembly language programs using the Pascal editor.
R.R.P. **£35** + VAT.

. . . SOLE EUROPEAN DISTRIBUTOR FOR THE MOST VERSATILE 80 COL

★ Character dot matrix is 9 x 11 which provides three lines of dots for full descenders on lower case letters. The full ASCII set of 128 characters is provided.

★ Shift key does what you would expect it to do, and also has a shift lock facility and a visual LED shiftlock indicator.

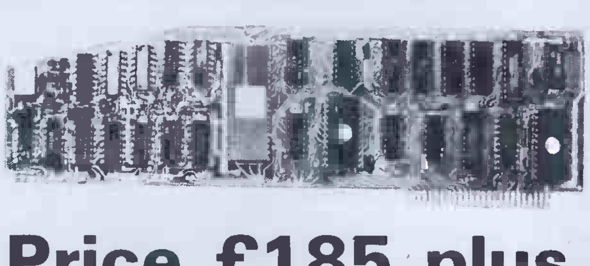
★ Character set also includes twelve additional keys not normally available on the Apple keyboard.

★ This card includes a built in softswitch i.e. no cable changes necessary when switching between 40/80 columns and graphics.

★ The built in communications software driver gives your Apple the ability to be used as a true interactive intelligent terminal to mainframe computers or communications facilities. Fully compatible with CCS serial cards and Apple communication cards etc.

★ The Vision 80 typeface is of an attractive appearance and is highly legible due to its large 9 x 11 character font.

VISION-80



Price £185 plus VAT

AVAILABLE DIRECT FROM **PACE** *OR FROM YOUR LOCAL APPLE DEALER*

ESSORIES

PECIALISTS ....

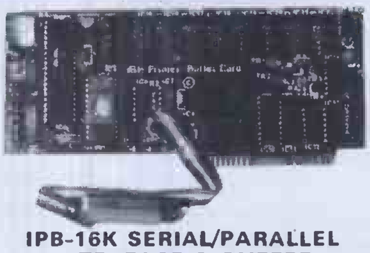
PACE

0274 729306

n UK   Many more items available

orth (fast 3D utility plus music)	46.00	52.90
hics Magician (Penguin)	39.00	44:85
hic package Sublogic (3D pack)	74.75	85.96
er Text II (many diff fonts)	25.45	29.27
tain Music System (16 voice)	232.00	266.80
al Animation	41.00	47.15
Animation tools	41.00	47.15
ial Effects (Penguin)	27.00	31.05
Artist	55.00	63.25
awriter (graphic digitizer)	179.00	205.85
awriter expansion pac 1	25.00	28.75
Grafix (similar to Bit Stick zoom)	23.95	27.54
x	18.95	21.79
II (speech synthesizer)	165.00	189.75
ric Duet (creates 2 part music)	21.00	24.15
e	15.95	18.34
M. (software automatic mouth)	75.00	86.25
ITIES		
s (Applesoft structured Basic)	18.95	21.79
e Mechanic (Beagle Brothers)	25.00	28.75
mbly lang. Dev. (6502, Z80, 8080)	75.00	86.25
f Tricks	24.95	28.69
.T. (Enhanced Software Tool)	23.95	27.54
Using (provides 'print using' cmnd)	23.95	27.54
II Plus	35.00	40.25
Doctor (CP/M disc recovery)	89.00	102.35
Library (incl CP/M & Pascal)	34.95	40.19
3.3 Tool Kit	41.00	47.15
Boss (modifys Dos Commands)	15.00	28.75
Soft (powerful macro line editor)	19.95	22.02
DOS	19.45	22.37
l Program Line Editor (supports 80col)	35.50	40.83
e Printer-Epson (flexible hi-res dump)	32.00	36.80
Master (inc. smart renumbering)	23.95	27.54
smith 4.1 (bit copier for most discs)	61.00	70.15
n Micro Assembler	42.00	48.30
ch A Bug	32.00	36.80
ographer	28.95	33.29
d Star (1200 lines per min)	75.00	86.25
ctured Basic (U Micro)	£90.00	£103.50
r Disc Copy III	25.00	28.75
Compiler (handles v. large programs)	105.00	120.75
Bug (Assembly Language debugger)	35.00	40.25
Inspector (needs 16K cd)	35.00	40.25
Routine Machine (mach. lang. routines)	45.00	51.75
Routine Machine Utilities	34.50	39.68
TEM EXPANSION		
Ramcard Digitek	75.00	86.25

16K Ramcard (Intelligence Research)	55.00	63.25
32K Ramcard Saturn	135.00	155.25
128K Ramcard Saturn	299.00	343.85
128K Ramex card	275.00	316.25
Accelerator II	285.00	327.75
Cool stack (holds 2 drives, monitor, fan	65.00	74.75
CPM+ (incl. 64K)	285.00	327.75
DOS upgrade kit (3.2 to 3.3)	36.00	41.40
E-Z Port (game socket extender)	17.00	19.55
E-Z Port II (2 game socket extenders)	22.00	25.30
Eprom Card (holds 6)	52.00	59.80
Hawk 34 Way Switch via card	49.00	56.35
Hawk IEEE 488 card	189.00	217.35
Lower case adapter W/shift (rev 7+)	34.00	39.10
Pact clip on fan	46.00	52.90
The Mill 6809 with Pascal speed up	189.00	217.35
Time Kit	55.00	63.25
VC-Expand/80 (up to 145K Visicalc & 80 col)	65.00	74.75
VC-Expand 80.2 (loads 136K visi in 20 sec)	80.00	92.00
Videx Function Strip (req Enhancer II)	49.00	56.35
Z80 card U-micro (card only)	83.00	95.45
Z80 card Microsoft (New Softcard)	199.00	228.85
LANGUAGES		
Apple Logo	122.00	140.30
Apple Pascal	142.00	163.30
Apple Pilot	80.00	92.00
Apple Super Pilot	129.00	148.35
Cobol 80 (CP/M)	399.00	458.85
Forth (Metacraft)	75.00	86.25
Forth II (Integer only)	45.00	51.75
Fortran 80 (CP/M)	112.00	128.80
Terrapin Logo	95.00	109.25
Transforth (full floating point Forth)	75.00	86.25
MISCELLANEOUS ITEMS		
Disc Drive (Fully Apple Compatible)	199.00	228.85
Disc Drive Controller Card	54.00	62.10
Disc Head Cleaning Kit (50 discs & fluid)	19.95	22.94
Disc tray (40 discs & lockable)	17.45	20.07
Eprom Prog (Namal)	93.00	106.95
Games Paddles	25.00	28.75
Joystick (Self Centering)	38.00	43.70
Plastic Disc Box	2.50	2.88
Snapshot II	93.00	106.95
Typing Tutor II	16.50	18.78
Wabash 5.25 Discs Pack of 10	17.95	20.64
Wildcard (permits software backup)	93.00	106.95



IPB-16K SERIAL/PARALLEL INTERFACE & BUFFER

Now you need only one interface card to support both your daisywheel and dot matrix printers plus the benefits of a 16K buffer to speed things along. £129 + VAT.

12" KAGA MONITOR

Features 24 M/Hz bandwidth, giving a very clear display, and contained in a neat Apple compatible case. Green screen £105 + VAT.

MICROVITEC 14" COLOUR MONITOR

Besides offering a crystal clear display in either text, hi-res or low-res modes. It also includes the following features, 16 text colours, b/grd colours, 80 column card compatibility. A superb colour monitor for £265.00 + VAT.

COL VC EXPAND

-boot utility which gives 136K memory h Visicalc and 80 columns when using 8K RAM cards with your Vision 80. R.P. **£39** + VAT.

80 COL APPLEWRITER II

Pre-boot utility giving a beautiful display with Applewriter II for the Vision 80 or Screenmaster 80 – the resultant display is better than an Apple III running Applewriter. R.R.P. **£18** + VAT.

D *AVAILABLE*

supports all Applesoft commands including the Window i.e. Home,Text,GR,HGR,HGR 2,Tab etc. It verse and normal display i.e. Highlight and ght in CP/M and Pascal.

s possible to change the cursor character to a block cursor or an underscore cursor. The of cursor blink can be altered and it is also le to re define the character set with your own nalised font.

e card comes complete with nstration/utilities disc and is simple to install. It ncludes a comprehensive users manual.

ally compatible with Apple plus, and Apple //e. It with Pascal and CP/M and some of the many are packages it supports are, Wordstar 3.0, writer II, Letter Perfect, Format 80, Zardax, tive Secretary, Magic Window, Visicalc, and lan (CP/M or DOS).

e Vision 80 can accommodate two character sets, nal and an alternative and it is possible to ce your own alternative character set and toggle en the two.

PACE SOFTWARE SUPPLIES

92 New Cross Street, West Bowling, Bradford BD5 8BS.

	Net	VAT	TOTAL
TOTAL			

I enclose my cheque made payable to PACE SOFTWARE SUPPLIES

Name ....

Address .... Town ....

County .... Postcode .... Tel No ....

Pete & Pam Computers

REGISTER OF OEM's

APPLES ARE USED FOR THE MOST AMAZING THINGS

Datalogging, typesetting, process control, precision measurement, animation control, and space flight are just a few of the areas of application in which Apple has starred. Pete & Pam's Lancashire office, with the assistance of Apple UK, are setting up a register of OEM's and their Apple applications. The Lancashire office will then act as a clearing house for information, and will provide advice, support, and a source of supply for OEM's. If you think you might qualify for the program, write to or call our Lancashire office now. You could put yourself on the road to a profitable partnership.

Accelerator II

Over 1400 Accelerator II users are saving valuable time by using the board to speed up the execution of all native Apple II+ programs by up to 3.5 times!

If you value your time, and want to get the most out of your Apple II (and, incidentally, make your Apple II faster than an IBM PC or a SIRIUS!) then buy an ACCELERATOR now. Contact your local dealer or ring us direct. **£299 + VAT**

Apple IIe version due by late October.

DO YOU WANT A JOB?

If you think you have a pleasant outgoing personality, and have some experience of the Apple II, IBM PC, or other computers, ring Chris Gillard in our London Office.

He's interested in increasing the number of sales staff to enable us to cope with all the sales telephone calls we receive. We promise staff that they will never be bored!

SATURN SYSTEMS

GOT AN APPLE IIe? WOULD YOU LIKE MORE MEMORY?

Saturn's NEPTUNE boards are 64K memory and 80 column boards for the IIe, expandable up to 192K. The boards come complete with a software pre-boot disk to allow you to use the additional memory with Visicalc.

PART EXCHANGE DEAL

We'll even offer to part-exchange your Apple 80 column board for £20 or your Apple extended memory 80 column board for £40 to help you move up to 192K on NEPTUNE!

NEPTUNE 64K BOARD
£179 + VAT
Each additional 64K (up to max 192K) — £109 + VAT

Other memory boards from Saturn for Apple II+ and IIe...

SATURN 128K
£299 + VAT
SATURN 32K
£129 + VAT
VC EXPAND SOFTWARE
£39 + VAT
VC EXPAND 80 SOFTWARE
£49 + VAT

SUPER SEALER

The DMS SEALER is a hot-wire sealing system, ideal for use by software publishers, hardware manufacturers etc. The unit consists of a roller platform with bar sealer which, together with film and heat gun provides the facility for producing neat, tidy shrink - wrapped packages. The price of the SUPER SEALER puts a shrink wrapping facility within the reach of even the smallest software house or dealer.

SUPER SEALER
£249 + VAT
ROLL OF FILM TO SUIT
£30 + VAT

LOWER CASE ADAPTOR

Allows you to see lower case letters on the screen when used in conjuction with software such as a word processing program.

(Rev. 0–6) £17 + VAT
(Rev 7) £15 + VAT

Are you a DEC user?

DOES VT100 MEAN SOMETHING TO YOU?

Would you like a more inexpensive VT52 terminal, with many VT100 features at an inexpensive price?

Zenith's new Z-29 "Smart" compatible terminal features:

12" non-glare green phospher display, 91 key keyboard.

Set up-on screen, menu driven

Set up for most terminal options emulation mode, band rate, parity half/full duplex.

Special graphics with 33 special Symbols.

Excellent value for money — we know, we use them ourselves.

£595 + VAT

THIS MONTHS SPECIALS

Supercalc for ALS Z Card	39.00
Magic Mailer	34.00
Magic Words	34.00
Hellfire Warrior	19.95
Star Warrior	19.95
Upper Reaches of Apshai	9.95
Red Alert	16.95
Duelling Digits	16.95
Labyrinth	16.95
Star Thief	16.95
Head-On	12.95
Fact Fun	12.95
Word Fun	12.95
Macro Screen Editor	12.95
Network	12.95
Windfall	12.95
Phazer Fire	16.95
Neptune	18.95
Lazer Silk	16.95
High Orbit	16.95
Acid-Based Titration	49.00
Ideal Gas Law & Entropy	49.00
Calarimetry Experiments	49.00
Job Cont./Costing in Pascal	49.00
Easymailer 80	69.00
Transform II	69.00
Wordtrix for IBM PC	16.95
Decision Modeller	399.00
Jaw breaker	16.95
Screenwriter II	79.00
Mouskattack	18.95
Cannonball Blitz	19.95
Lunar Leeper	16.95
Crossfire for IBM PC	16.95

Lisa

The first of Apple's new person office products systems. If you'r into ICONS and are fascinate by what 200 man years of softwa development can produce the this machine must be for yo See Lisa at either of our office Lisa is available for sale, lease o rent — (even for one day!).

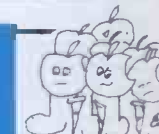
AXLON RAMDISK 32

320K BYTES OF RAM MEMOR FUNCTIONS LIKE TWO 35 TRACK, TWO 40-TRACK, O ONE 80-TRACK FLOPPY DRIVE.

The ultra fast RAMDISK is u to 50 times faster than standar floppy drives, and 10 tim faster than hard disk drive RAMDISK 320 has its own powe supply, plus three hour back-u The drive is fully compatibl with DOS 3.3, SOS, CP/M, Appl Pascal 1.1, and PASCAL 4. (The driver disks come with eac RAMDISK) Comes with plug i slot independant interface car special designed operating pr gram, plus software for diagnostic and fast load copy routine Warrantied for 12 months.

£699 + VAT

Pete & Pam Computers



Mail Order & Distribution:
New Hall Hey Road,
Rossendale, Lancs., BB4 6JG
Phones:
(0706) 212321 & 227011
Telex: 635740 Petpam G

Norwegian Agent:
The Norwegian Software House
Address Okernveien 145
Oslo 5
Telephone 47 2 64 55 77

London Retail:
103-5 Blegborough Road,
London, SW16 6DL
Phone: 01-677 7631
London Office Open Saturdays

Prices do not include VAT please add 15% to your remittance
Postage and Packing FREE

at the sign of the
BIG 'M'

MICRO MANAGEMENT

LOW prices BEST service

- Britain's No 1 range of products
- Check our UK dealer network for your nearest outlet
- After sales, speedy service from our own factory and engineers

It's our aim to provide satisfaction at the sign of the Big 'M'. By providing local distributors, best prices and service, we offer you the most. If you don't see it in our ad., ask your local distributor, or write to our Head Office for full list.

All prices include VAT.
All prices correct at time of going to press, but, subject to change.

All products normally in stock but to prevent a wasted journey phone your local dealer first before calling.

BBC:

HARDWARE

A full colour 32k ROM computer with 7 text and graphic modes up to 640 × 256 graphics and 80 column text screen, extended microsoft basic, built-in assembler, 1 MHz and tube interface, sideways ROM, RS423, A/D converter.

BBC Model B

PRICE £399

BBC Model B+
Econet

PRICE £446

BBC Model B+
Disk Interface+
Econet (fitted)

PRICE £516

PROFESSIONAL WORD PROCESSING PACKAGE

BBC computer with disk interface, 100K disk drive, green screen monitor, daisy wheel printer, word processing ROM, complete with all cables, manuals, paper and formatting disk.

PRICE £1299

SINCLAIR

SPECTRUM

16K and 48K, basic, colour, text and graphics, vast range of software including education, printer, built-in speaker. You can build a very good system at a very good price.

ZX SPECTRUM 48
PRICE £129.95
ZX SPECTRUM 16
PRICE £99.95

ZX81

1K RAM, worlds largest-selling computer, 16K expansion pack, masses of software, basic language, many expansions including keyboard/memory/printer, high resolution graphics.

PRICE £39.95
16K RAM
PRICE £29.95
ZX PRINTERS (NO PSU)
PRICE £39.95

COMMODORE

COMMODORE 64–64K RAM, colour, sophisticated ROM/RAM user, full business applications, disk drives available, sound, UHF/composite video, proven basic language, exceptional value, high resolution graphics, many "add-ons" available, printers.

COMMODORE 64
PRICE £229.00
CASSETTE UNIT
PRICE £44.95
DISK DRIVE 1541
PRICE £229.00
PRINTER 1515
PRICE £230.00
JOYSTICK 1311
PRICE £7.50
PADDLES 1312
PRICE £13.50

COMMODORE AND SINCLAIR SOFTWARE SEND FOR LISTS

SPECIAL OPPORTUNITY

£1 OFF PURCHASES OVER £20

Use this coupon to get even better value at your local Big 'M' distributor. Check our list for your nearest store.

£1 OFF

This coupon can be used at any official Micro Management distributor. The bearer is entitled to a £1 reduction on purchases over £20. Only one coupon per person can be redeemed.
Valid until 31 December 1983.
Micro Management, 16 Princes St, Ipswich.
pcw

DRAGON

DRAGON 32

32K RAM, colour, extended basic, sound 5 octaves 255 tones, vast software range, typewriter keyboard, standard cassette drive, high resolution graphics, 256 × 192, text 16 + 32, looks like a British worldbeater.

PRICE £174.99

DRAGON SOFTWARE– SEND FOR LIST

at the sign of the BIG

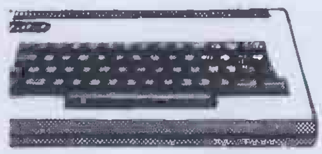
WORK STATION

Designed to take computer, disk drive, printer and paper. Robustly built for school, business or home use.

700mm
PRICE £118.00

1100mm
PRICE £138.00

LYNX



LYNX 48

48K standard, expandable to 192K, colour, 57 key typewriter keyboard, CP/M compatible, serial port, high resolution graphics 265 × 248, digital/analogue sound converter, RGB/UHF composite video, RS232/parallel, cassette.

PRICE £224.99

LYNX 96K
PRICE £299.00

JOYSTICK INTERFACE
PRICE £13.95

SERIAL INTERFACE
PRICE £3.99

CENTRONICS INTERFACE
PRICE £49.95

at the sign of the BIG

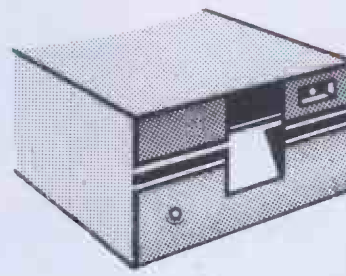
DISK DRIVES

100K SINGLE
PRICE £199.95

200K SINGLE
PRICE £241.50

400K SINGLE
PRICE £396.75

800K DUAL
PRICE £711.85



at the sign of the BIG

JUPITER

JUPITER ACE

3K RAM, the Forth specialist, basic coming, Forth language excellent, for serious educational and scientific purposes, standard cassette.

PRICE £69.95

at the sign of the BIG

ORIC

16-48K, colour, high resolution graphics 240 x 200, text 28 + 40, pre-programmed sound user-defined keyboard/graphics, non touch sensitive keyboard, microsoft type basic with powerful extensions, RGB/UHF, standard cassette interface, parallel printer output, several periferals available, printers available, modems and PRESTEL (coming).

ORIC–1 48K
PRICE £139.95

ORIC–1 16K
PRICE £ TELEPHONE

at the sign of the BIG

New

ELECTRON
son of the BBC
See it at selected dealers
NOW!

GIFT VOUCHERS

Want to buy a present but don't know exactly what to get?

Big 'M' Gift Vouchers are the answer, in £5, £10 a £20 denominations. Available at your local Big dealer–check our list for your local store.

PRINTERS

SEIKOSHA GP100
PRICE £214.99

SEIKOSHA GP250
PRICE £276.00

NEC PC 8023 (D/M)
PRICE £368.00

EPSON MX100
PRICE £488.75

EPSON RX-80
PRICE £339.25

EPSON FX-80 160cps
PRICE £454.25

SPARK JET PRINTER
PRICE £419.75

SMITH CORONA D/WHEEL
PRICE £511.75

TEC STARWRITER 40cps
PRICE £1265.00

JUKI 6100 D/WHEEL
PRICE £458.85

STAR MUP4 GRAPHICS
PRICE £171.35

STAR DP510
PRICE £316.25

SHINWA CT1 CP80
PRICE £343.85

MONITORS

RGB COLOUR STD/RES
PRICE £247.25

RGB COLOUR H/RES
PRICE £632.50

12″ GREEN MONITOR
PRICE £95.52

12″ AMBER MONITOR
PRICE £120.75

RETAILERS WANTED

Think you're good enough to become a Big 'M' distributor? Full back up given. Write for details and application forms to

Steve Macfarlane
Micro Management
16 Princes St, Ipswich
Tel: (0473) 219461

MICRO MANAGEMENT

Head Office: 16 Princes St, Ipswich 0473 219461

AGENTS

Abergele
Abergele Computer Centre
8 Water St. 0745 826234

Ballymoney
Everyman Computers
Charlotte St. 02656 62116

Bedford
The Software Centre
52a Bromham Rd 0234 44733

Birmingham
The Software Centre
80 Hurst St. B5 021 622 2696

Blackburn
Microwise, Conliffe Road
Whiteburch Estate 0254 678933

Bodmin
Microtest Ltd
18 Normandy Way 0208 3171

Bridgend
Automation Services
31 Wernlys Rd, Penyfai 0656 720959

Bristol
Brensall Computers Ltd
24 Park Row 0272 294188

Bromley
Datastore
6 Chatterton Rd. 01 460 8991

Bury St Edmunds
Bury Computer Centre
Guildhall St. 0284 705772

Cambridge
GCC (Cambridge) Ltd
66 High St, Sawston 0223 835330

Chelmsford
Essex Computer Centre
Moulsham St. 0245 358702

Clacton-on-Sea
Clacton Computer Centre
Pier Avenue 0255 422644

Co. Durham
Knowledge Ltd.
15 North Burns, Chester le Street
035 881014

Colchester
Emprise Ltd
58 East St. 0206 865926

Capricorn Computer Centre
32 North Hill 0206 68471

Coventry
Coventry Micro Centre
33 Far Gosford St. 0203 58942

Derby
First Byte Computers
10 Castlefields, Main Centre
London Road 0332 365280

Gloucester
The Model Shop
79 Northgate St. 0452 410693

Great Yarmouth
Criterion Computers
12 George St. 0493 53956

Guildford
The Model Shop
23 Swan Lane 0483 39115

Hastings
The Computer Centre
37 Robertson St. 0424 439190

Haverford West
Business Information Systems
22 Market Courtyard Shops
0437 2776/68228

Hay-on-Wye
The Playpen
Market St. 0497 820129

Hemel Hempstead
Faxminster
25 Market Square 0442 55044

Holyhead
P & K Computers
33 Williams St. 0407 50283

Horsham
Micro Store
131 West St. 0403 52297

Hull
Computer Centre (Humberside)
26 Anlaby Rd 0482 26297

Ilfracombe
Bits & Bytes
44 Fore St. 0271 62801

Ipswich
Micro Management
32 Princes St. 0473 59181

Kingston-on-Thames
Vision Store
3 Eden Walk 01 549 4900

Lichfield
Fosters
59 Tamworth St. 05432 22341

Liverpool
Beaver Radio
20/22 Whitechapel 051 709 9898

London
Computers of Wigmore St.
87 Wigmore St. W1 01 486 0373

Percivals
219 High St. Eltham, SE9
01 472 8941

Northampton
Richard Reeves
174 Kettering Rd 0604 33578

Norwich
Richard Pank
Anglia Square 0603 27963

Plymouth
Syntax Ltd
46 Cornwall St 0752 28705

The Model Shop
11 Old Town St. 0752 21851

Shetland
Tomorrows World
Esplanade, Shetland 0595 2145

Southend-on-Sea
Estuary Software
261 Victoria Ave. 0702 43568

Stevenage
Video City
45/47 Fisher Green Rd. 53808

Stirling
Micro Store
3 The Arcade

Stroud
The Model Shop
22 High St. 04536 5920

Surbiton
Computasolve
8 Central Parade, St Marks Hill
01 390 5135

Taunton
LA Gray
1 St James St. 0825 72986

West Bromwich
Bell & Jones
39 Queens Square, Sandwell Centre
021 553 0820

West Croydon
Universal Micro Peripherals Ltd.
233 London Rd. 01 683 0060

Woking
71 Commercial Way
04862 25657

UCSD p-System
designed for change

Change of hardware that is, not software! This is because the UCSD p-System is the first truly portable operating system ever developed. No longer is there need to worry about 8 bits, 16 bits or even 32 bits, the p-System runs them all! Whether it's an ACT Sirius/Victor, Apple, Osborne, IBM PC, Displaywriter, DEC PC, TI, SAGE or even VAX, the same operating system and software are available. And what an operating system it is! Genuinely user friendly, it provides a superb screen editor that's addictive, a comprehensive file manager and the option of three development languages Pascal, FORTRAN 77, and BASIC.

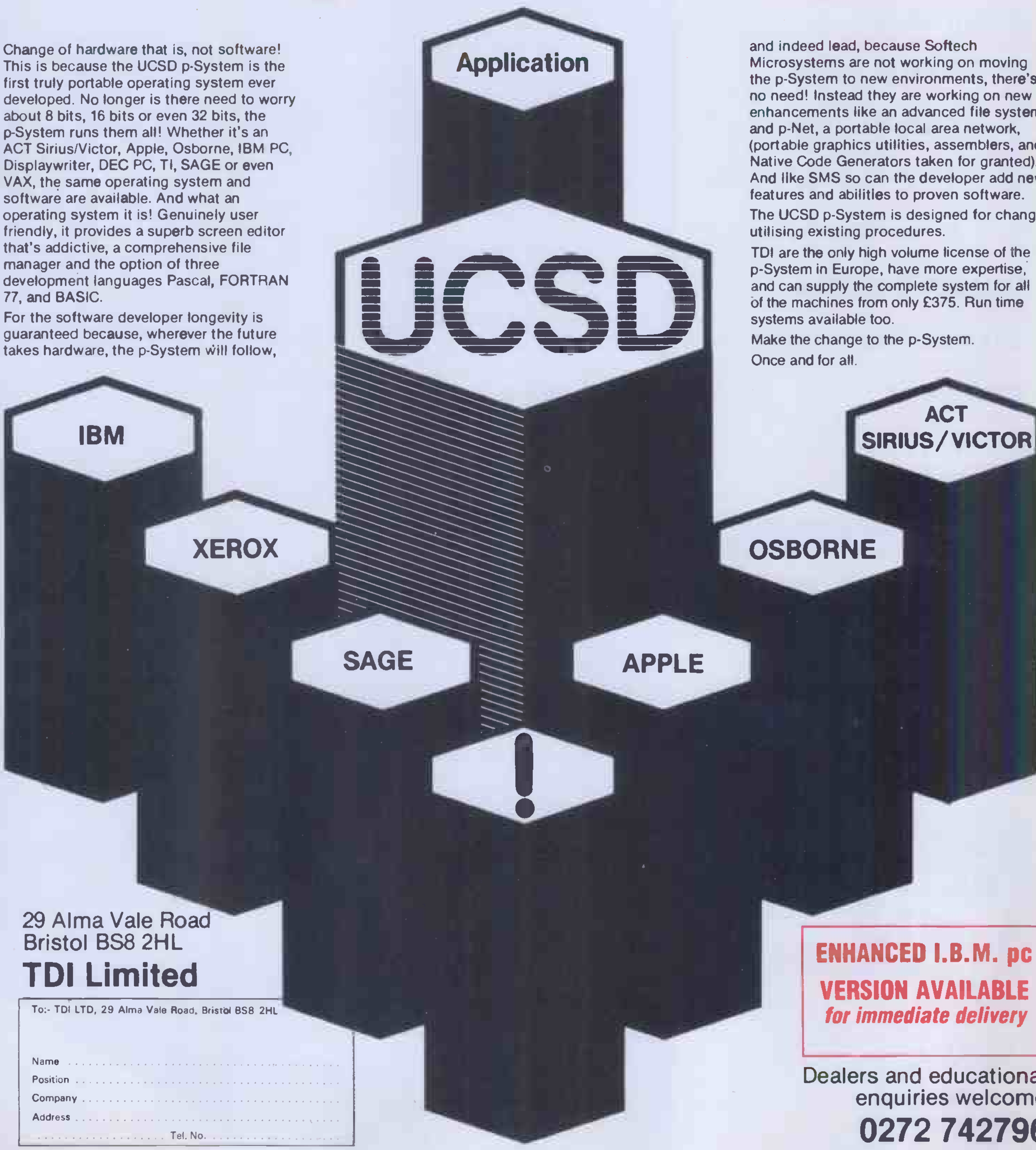
For the software developer longevity is guaranteed because, wherever the future takes hardware, the p-System will follow, and indeed lead, because Softech Microsystems are not working on moving the p-System to new environments, there's no need! Instead they are working on new enhancements like an advanced file system, and p-Net, a portable local area network, (portable graphics utilities, assemblers, and Native Code Generators taken for granted). And like SMS so can the developer add new features and abilities to proven software.

The UCSD p-System is designed for change utilising existing procedures.

TDI are the only high volume license of the p-System in Europe, have more expertise, and can supply the complete system for all of the machines from only £375. Run time systems available too.

Make the change to the p-System.

Once and for all.



29 Alma Vale Road
Bristol BS8 2HL
TDI Limited

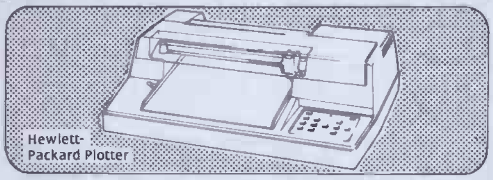
To:- TDI LTD, 29 Alma Vale Road, Bristol BS8 2HL

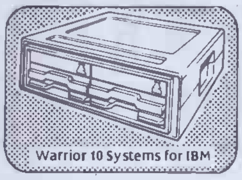
Name ....
Position ....
Company ....
Address ....
.... Tel. No. ....

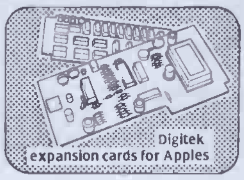
ENHANCED I.B.M. pc VERSION AVAILABLE
for immediate delivery

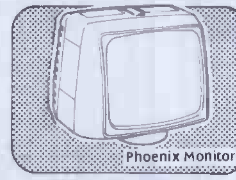
Dealers and educational enquiries welcome
0272 742796

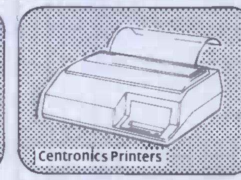
watch out for data warrior

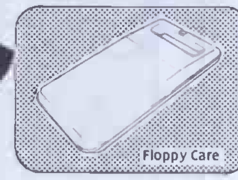


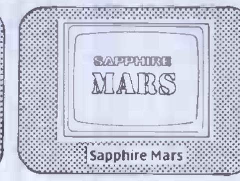












Data Warrior are proud to announce the launch of their new product range which includes the highly acclaimed Hewlett-Packard 747 0A Plotter. The only one with "Sweet-Lips" technology.

There are many other products available in our extensive range and these include Warrior 10 System for IBM; Sirius; Apple and S100 BUS; Digitek Expansion Cards for Apples; Phoenix Monitors; Centronics Printers; Sapphire Mars – CP/M Financial Modeller and a wide range of BASF Floppy discs.

We have an extremely competitive pricing structure which includes dealer's stocking finance and end user leasing. What's more we can offer very fast deliveries (48 hours in most cases) and a comprehensive and highly geared organisation.

Data Warrior will soon be a force to be reckoned with.

Watch out for Data Warrior.

This advertisement shows only a small part of our range. For complete details please complete the coupon or telephone:

Name ______________________

Company ______________________

Position ______________________

Address ______________________

____

Data Warrior, Adelaide House, 9 Adelaide Street, St Albans, Herts AL3 5BE.
Telephone: St Albans (0727) 37327.

ACT Sirius 1

TOWN & COUNTRY COMPUTER SYSTEMS

SYSTEMS HOUSE, 489A HERTFORD ROAD, ENFIELD, MIDDLESEX
01-805 0903

— 1.2 MB, 128K £2,195 or from £10.69 pw*
— 10 MB, 256K £3,995 or from £21.36 pw*

Ex demonstration and secondhand equipment always available, please ring for details.

— Payroll (includes SSP), Sales Invoice, Purchase Ledger, Nominal Ledger, Stock Control, Bill of Materials Processor, Order Processing, Materials Requirement Planning, Wordprocessors, Maintenance Management, SILICON OFFICE (Main Dealer), DMS, Spreadsheet, Accounts Preparation, Critical Path Analysis, Estate Agents, Solicitors, Basic Compiler, Graffix Toolkit, Programers Toolkit, Expansion Board, Matrix Printers, Letter Quality Printers, Sheet Feeders, Printers with Keyboard, Acoustic Hoods, Dust Cover, Disk Boxes, Computer Furniture, Disks, Continuous Stationery, Communication Software, MULTI-USER, NETWORKING.

— Full Training and Support from the top professionals in Microcomputing.

— NEW Demonstration/Training Complex open August 1983.

** WE HAVE A FULL OFFICE OF FAIR TRADING LICENSE*

Professional Systems **Professional People** **Professional Equipment**

PACE

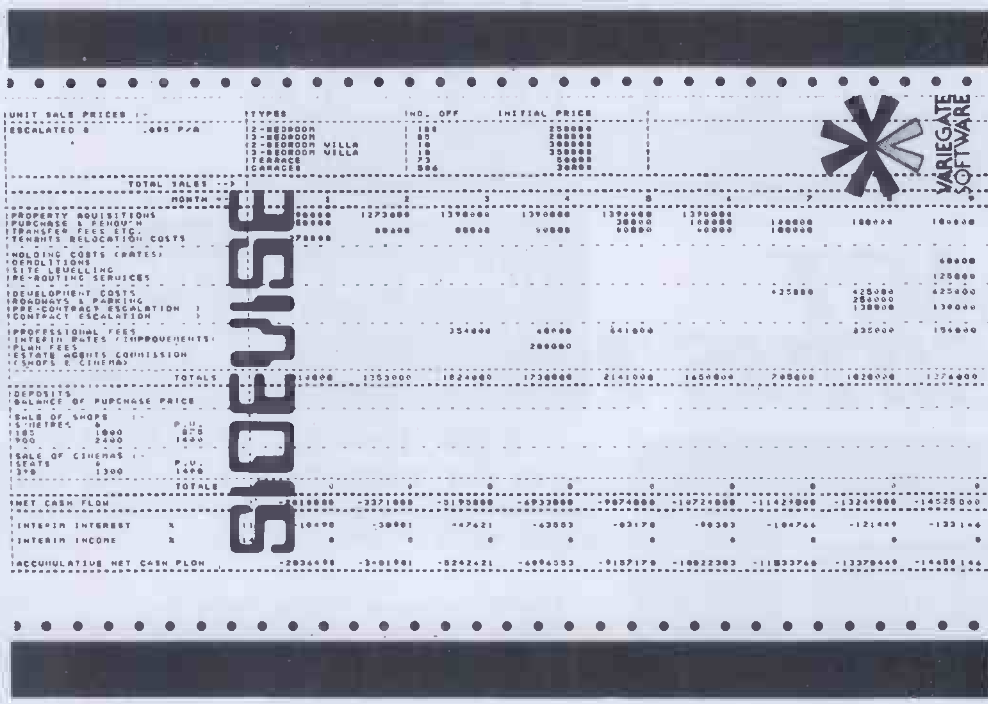
SOFTWARE SUPPLIES LTD

Registered office: 92 NEW CROSS STREET BRADFORD BD5 8BS
TELEPHONE 0274 729306 • TELEX 51564-SHAREY-133

VISICALC USERS

AT LAST AN OPPORTUNITY TO PRINT VISICALC SPREADSHEETS SIDEWAYS

SIDEVISE



SIDEVISE allows APPLE II, 11 plus and 11e users to print their VisiCalc spreadsheets sideways. No longer does the width of the printer limit the size of your spreadsheet.

This unique program is available from PACE Registered office:

By Mail Order from your local Apple dealer at £40 plus VAT.

PACE SOFTWARE SUPPLIES LTD.
92 NEW CROSS ST, BRADFORD BD5 8BS
Tel: 0274 729306

S P L

SPRAKEFIELD LTD

137 HIGH STREET SOUTH
DUNSTABLE, BEDS. Tel: (0582) 608818

Access

ALL PRICES INCLUDE VAT & CARRIAGE

PRICES DOWN ON SOFTWARE & PRINTERS

FLOPPY DISKS — BOXES OF 10

VERBATIM 5¼"	**1-3**	**4-7**	**8+**
MD525 SSDD	19.78	19.26	18.78
MD550 DSDD	28.12	27.38	26.69
MD577 SSQD	30.53	29.75	28.98
MD557 DSQD	36.92	35.96	35.05
DYSAN 5¼"			
104/1 SSSD	28.13	27.70	27.29
104/1D SSDD	30.43	29.96	29.52
104/2D DSDD	43.34	42.68	42.05
204/1D SSQD	42.28	41.64	41.02
204/2D DSQD	56.08	55.23	54.40

LIBRARY CASE 1.69 EXTRA

FREE FLOPPY DISK PEN WITH EVERY BOX

SOFTWARE

dbase II	£442.75
Lotus 1-2-3	£341.55
VisiCalc	£183.97
WordStar	£284.63
Mailmerge	£143.75
Spellstar	£143.75
Perfect Writer	£189.75
Perfect Calc	£112.21
Perfect Files	£228.08
Basic Compiler	£272.55
Pascal Compiler	£241.50
C Compiler	£345.00

(Apple, Commodore, IBM, DEC, CP/M)

5% OFF — Yes you can save 5% off the price of any item in the ad. Just clip out the ad and send it with your order and you can deduct 5% off the quoted price.

MONITORS

Hi-Res 12" Monitor
Green **£117.46**
Amber **£124.86**
Colour 14" 800-dot RGB
for IBM PC
£671.93

PRINTERS

Epson RX80	£309.73
Epson FX80	£462.00
Epson MX100	£497.00
Oki M80A	£251.47
Oki M82A	£371.07
Seikosha GP100A	£230.00
Smith Corona TPI	£483.00
Ricoh RP1600	£1648.33
Ricoh RP1300	£1311.00
Flowriter	£1748.00

Disk Utilities for CP/M

for ANY DISKETTE FORMAT

These general disk utilities work on ANY single user CP/M 2.x system, with ANY diskette size and format, and many hard disks. All are menu driven, and easy to use.

DDUMP makes it possible to examine and patch any byte on any sector, addressed by track and logical sector number — or addressed by allocation block number, both in HEX and ASCII format. May be used to study how CP/M allocates disk storage, to examine or repair a damaged disk and to recover lost data.

DTEST tests a disk for bad spots. Bad sectors are locked out from later use by CP/M by automatically collecting them in a «garbage» file. All errors are reported to printer and/or console. Reduces probability of later disk crashes. Indispensible for hard disks, as media cannot be replaced. Use DTEST before disk errors ruin your work!

DUSER enables you to have access from one user area (user number) to programs and/or files stored on other user areas, without having to keep duplicate copies of files on the disk. DUSER makes this possible by copying file entries from one user area to another, thus saving considerable disk storage space.

DDUP duplicates disks. It is independent of disk controller, drive, disk size and format. It only requires that source and destination disks are of the same format and density. It will also replace bad sectors on the source disk with blank sectors on the destination, thus enabling you to automatically recover (what can be recovered from) damaged files.

UNERA recovers accidentally ERAsed files.

Price: Only £ 19.95 each. All 5 together £ 69.95.
Complete set of 5 manuals: £ 12.00.
Specify format: 8" SS/SD, 5" HS Heath/Zenith or 5" Osborne disk. Include £ 5 per order for handling & shipping. VISA accepted.

Dealers/distributors inquiries invited.

Order from your dealer, or directly from:

ELEKTROKONSULT AS
Konnerudgaten 3
N-3000 Drammen
NORWAY

CP/M is a trademark of Digital Research.

A T

£5.50

SPLAT AN ORIGINAL 48K ZX-SPECTRUM CHALLENGE BY THE AUTHOR OF MINED-OUT. OBJECTIVES: EXPLORATION, SURVIVAL AND EATING GRASS!! Zippy, Plums, Rivers, A massive 21K play area, 7 levels to explore, User defined controls, also Kempston & A.G.F. joystick compatible, £500.00 High Score Competition, SPLAT evolution by Ian Andrew & Ian Morgan. Also available from all good computer shops.

Please send me ..... copies of SPLAT @ £5.50 inclusive 1st Class Post.
I enclose cheque/P.O. for £ ...... or please debit by Access Card No.

Name ....

Address ....

ISL INCENTIVE SOFTWARE LTD — 54 LONDON STREET — READING (0734) 591678

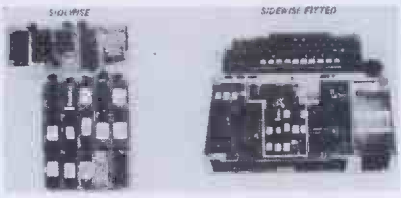
Electronequip

Upgrades

		Exc. VAT	Inc. VAT
UGATOB	BBC Model A to Model B Upgrade (ANA11)	66.50	76.48
UGOISC	Oisc Upgrade for BBC B (ANB13)	76.00	87.40
UGECONET	Econet Upgrade for BBC (ANB12)	66.50	76.48
UGSERIAL	Seeial Port Upgrade for BBC (RS 423)	9.50	10.93
UGSPEECH	Speech Upgrade for BBC (ANB14)	45.44	52.25

Spares

SP1.2ROM	1.2 Operating System Rom	6.00	6.90
SP6522	6522 VIA Chip for BBC	5.22	6.00
SP8271	8271 Disc controller chip for BBC	40.00	46.00
SP2764	2764 300nS Eprom suitable for BBC	4.75	5.46



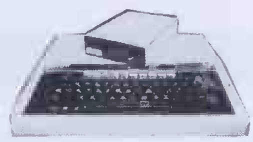
SIDEWAYS ROM BOARD FOR BBC (no soldering) only £38.00+vat

ROMs

BRASVIEW	View word processing package (SBB03)	49.40	56.81
BRCCBEEC	Beebcalc rom (spread sheet) (Com. Con.)	32.30	37.14
BBRCDISC	Computer Concepts Oisc Doctor rom	26.60	30.59
BBRCCTERM	Computer Concepts Termi rom (Terminal)	26.60	30.59
BRCCORW	Wordwise Word processing ROM	33.54	38.57

Large Stocks. Vast range of Software (not just games).
All printers and Disc drives are supplied with all connecting cables, formatting discs, cases, documentation etc.

SPECIAL OFFERS
PHONE FOR DETAILS



Electronequip is an authorised Acorn service centre and has been an Acorn dealer since the introduction of the Atom.

Our demonstration facilities include 20 station Econet and Torchnet systems.

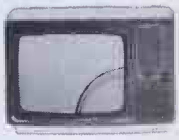
Ref.	*Description (BBC Micros)*	*Exc. VAT*	*Inc. VAT*
ANA01	BBC Model Computer	261.30	299.00
ANA02	BBC Model A with Econet Interface	310.86	356.00
ANA32	BBC Model A Micro with 32K	291.30	333.50
ANA33	BBC Model A Micro with 32K and VIA	296.52	339.50
ABA01	BBC Model B Micro Computer	343.04	393.02
ANB02	BBC Model B with Econet Interface	383.30	439.31
ANB03	8BC Model B with Disc Interface	403,00	461.97
ANB04	BBC Model B with Disc & Econet Interface	443.26	508.26
SYBWP1	BBC Wordprocessor View Disc Oaisy Print	1092.50	1256.38

Access & Barclaycard welcome. Large discounts for educational orders. Trade enquiries welcome.
Carriage 50p to £3.50.

Monitors

MNK12A	Kaga K12A 12" Orange Monitor	107.35	123.45
MNK12B	Kaga 12" Black/White Monitor	94.05	108.16
MNK12G	Kaga K12G 12" Green Monitor	94.05	108.16
MNKVIS2	Kaga 12" RGB Monitor Vision II (Medium)	230.75	311.36
MNKVIS3	Kaga 12" RGB Monitor Vision III (Hi)	379.05	435.91
MNM.1431	BBC 14" Colour Monitor (Microvitec 1431)	237.50	273.13
MNM1441	Microvitec 1441 High Res 14" BBC Monitor	474.05	545.16
MNM1451	Microvitec 1451 Medium Res 14" BBC Mon	355.30	408.60
MNN1434	14" TV/Monitor Nordmende	214.70	246.90
MNN3434	14" TV/Monitor Normende with remote cont.	224.10	257.72
MNSM12N	Sanyo SM12N Green Monitor 15MHz	75.05	86.31

EPSON
RX-80 & FX-80



Printers

PAETRACT	Tractor unit for Epson FX-80	34.20	39.33
PPFF1K	1000sheets fan-fold tractor feed paper	6.19	7.12
PPROLLTR	Roll paper for Sparkjet/Epson (TR-1)	1.70	1.96
PRCP80	Film Ribbon for CP-80 printer	4.75	5.46
PRE80	Ribbon for Epson MX/FX/RX 80	5.70	6.55
PRJP101	Inkjets for JP101 (pack of 4)	5.70	6.55
PRMX100R	Ribbon refill for Epson MX/FX 100	4.37	5.03
PRTP1200	Fabric Ribbon for Smiths Corona TP-1	2.85	3.28
PRTP1220	Film Ribbon for Smiths Corona TP-1	2.85	3.28
PTCP80	CP-80 80cps Printer (MX-80 type III)	284.05	326.66
PTFX80	Epson FX80 160cps Printer	365.09	419.85
PTFX100	Epson FX100 160cps Printer	493.05	567.01
PTJ6100	Junki Daisy Wheel Printer 18cps	365.09	419.85
PTJP101	BBC Spark-Jet Printer	284.05	326.66
PTMX100	Epson MX100 Type 3 Printer	422.75	486.16
PTMX80	Epson MX-80 80cps Dot matrix printer	350.55	403.13
PTRX80	Epson RX-80 Printer 100cps	257.00	295.55
PTRX80FT	Epson RX-80FT Printer 100cps (T/Fric)	280.25	322.29
PTT1040	TEC F10-40 40cps Daisy Wheel Printer	1220.75	1403.86
PTTCOLR	Torch Colour Printer	1472.50	1693.38

ACORN COMPUTER

Electronequip

BBC

36-38 West Street, Fareham, Hants (0329) 230670

MAKES FUN OUT OF LEARNING

Computertutor can give your child a head start with games that really make fun out of learning

Children of today are fascinated by computers. With micros already used in schools throughout the country their involvement in education and in our daily lives is increasing all the time.

To give young children a head start we've created, with parents, teachers and, of course, children, the Clever Clogs series, designed to appeal to children in the 3-7+ year old age group. Help them develop basic skills, stimulate imagination and Increase their self-confidence. Unlike similar products, each Clever Clogs program offers a wider choice of games to play. And each game can be made more 'difficult' by simple editing of the tape and resetting new questions. In this way you can keep up with your child's progress - even link the questions into work they're doing at school.

The Clever Clogs series can be used by your whizzkid on their own with initial help from you.

Price of each program £6.50 (incl Vat, P & P). Overseas orders £1 extra per tape for airmail delivery.

SPECIAL LAUNCH OFFER Buy 3 games - get one C20 blank tape FREE!

With parent's help even tiny tots will love to play these party games. They can 'blow out' the candles on a cake, sing along with nursery rhymes, even draw on the screen. If you have a printer you can record your Clever Clogs artistic efforts and watch their progress as they develop new skills. Because each Clever Clogs program offers a choice of games to play and has the facility to increase the 'difficulty' factor your children won't grow out of them so quickly.

At this age less parental help and guidance are necessary. Your child will continually be seeking new experiences and will enjoy his/her mind being challenged. Clever Clogs satisfies both criteria.

Correct answers to questions build up a picture of an animal - is it a real one? That's up to the player. Take your choice and create your own unique zoo and you can record them on your printer if you have one. By getting correct answers to several questions you can enter the great Safari Park chase . . . the possibilities are endless!

A game of skill and chance for 1-4 players that will get your whizzkids thinking hard. But Clever Clogs of this age like a challenge. You can proceed from the general knowledge questions already programmed and you can enter up to 250 questions of your own - there's tremendous scope here for the really clever, Clever Clogs! Watch them develop their three "R's" and in a way that will fascinate you as much as them.

*Also for ZX Spectrum 81 (16K)

Trade enquiries invited.

Please send me:

________ copies of PARTY TIME (3 yrs +) at £6.50 per tape
________ copies of JUNGLE JUMBLE (5 yrs +) at £6.50 per tape
________ copies of *WHIZZ QUIZ (7 yrs +) at £6.50 per tape
________ *Also for ZX Spectrum 81 (16K)

Computertutor, P.O. Box 3, St. Neots, Huntingdon, Cambs. PE19 3NW Telephone: (0480) 213969

I enclose cheque/PO for £

Name________

Address________

________ Postcode________

SU 10/83

Please allow 7 days for delivery

helistar

CUT THE COST

Cash and Carry Bargains from Helistar Systems

CALL: (0296) 631446/630364

DAISY WHEEL PRINTERS

Diablo 630 RO	£1450
Qume Sprint 11/40 RO	£1295
Adler TRD170 S	£585
BDT 560 Cut-Sheet Feeder	£545

DOT MATRIX PRINTERS

Microline 82A S/P	£295
Microline 83A S/P	£485
Microline 84 P	£745
Microline 84 S	£835
Microline 92 P	£419
Microline 92 S	£498

SUPERBRAIN

SuperBrain II Jr 350K	£1595
SuperBrain II QD 700K	£1895
SuperBrain II SD 1.5M	£2195

SuperBrain disk drive upgrades – increased capacity; from £390 to £520.

WINCHESTER HARD DISK

Capricorn II 10 Mb Winchester hard disk for SuperBrain	£1695
13Mb Tape Drive for hard disk back-up	£1620

SIRIUS

Sirius 128K 1.2Mb	£2195
Sirius 128K 2.4Mb	£2695
Sirius 256K 10Mb Winchester	£3995

EX-DEMONSTRATION

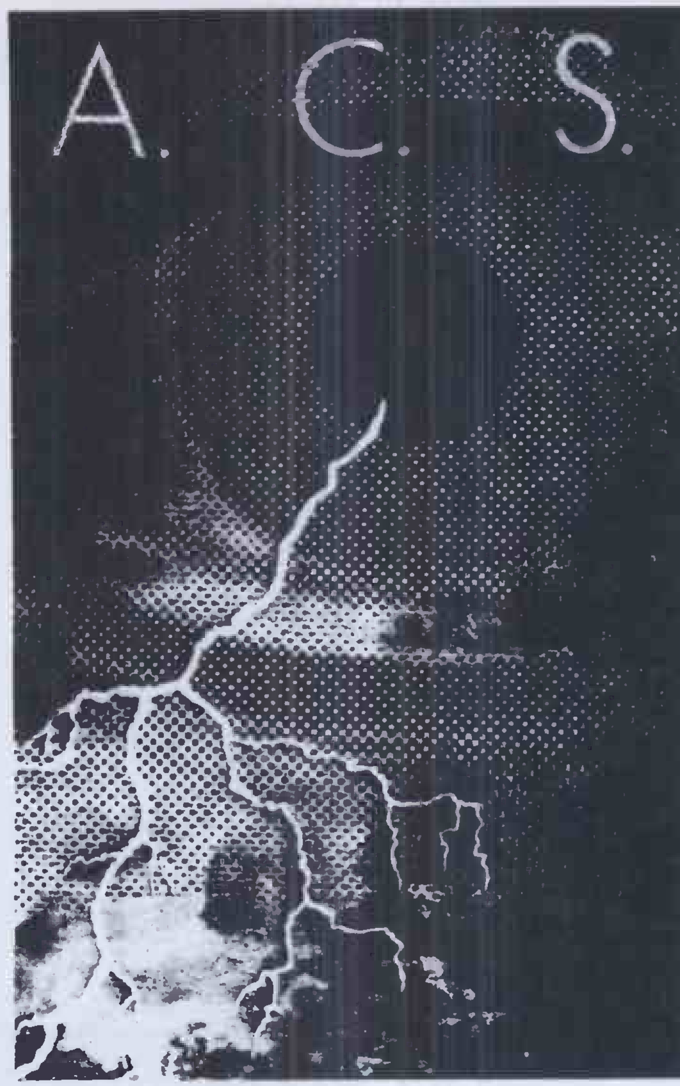
- IBM Personal Computer 256K £2400
- IBM Colour Graphics and PGS Colour Monitor £595
- Baby Blue Z80 board £195
- Sirius 128K 2.4Mb £2026
- Shelton Sig-Net Z80/64K, 700K disks and Ampex VDU £920
- Aquarius 10Mb hard-disk with integral tape back-up for Apple II £2600
- Anadex DP9500 matrix printer £490

Prices are exclusive of VAT and carriage and subject to change – please phone for latest details.

Hardware carries the manufacturer's parts and labour warranty. Optional 12-months on-site maintenance insurance available.

We have engineers and programmers to configure and install hardware and software – please ask for rates.

HELISTAR SYSTEMS LTD
150 Weston Road, Aston Clinton, Aylesbury, Bucks HP22 5EP
Telephone: (0296) 630364/631446



alpha
SOFTWARE CORPORATION

Data Base Manager II for the IBM® Personal Computer is the first software product that enables users to transfer files back and forth easily between a powerful database management program and leading word processing and spreadsheet packages such as 1-2-3™, VisiCalc™, Wordstar™, and Multiplan™.

Price: £189.00

For further information on other software products:

Call 01-883 7302
A.C.S. Ltd., Temple House
7 High Road, Finchley, London N2

WESSEXSOFT 16 EASTLAKE AVE PARKSTONE POOLE DORSET

LURE

A large rectangle is filled with black squares which are the holes in which you lure the chasers shown by chequered squares. You are the asterisk which flashes on the screen and must move around inside the rectangle avoiding holes and chasers. The chasers always run towards you. Use this fact to lure them into the holes where they die.

Keys 1-8 move the asterisk in the directions indicated on the rectangle. The required direction key must be held down as the chasers complete their moves.

After all the chasers are killed, or if you are captured or fall in a hole, a new frame will be created with less holes to lure the chasers in. You score 1 point for each chaser that is lured to its death. How much can you score in 11 frames?

ZX-81 @ £5.00 incl. P/P

DIRTY-DICE

This is a game for two players or one player and the computer. Both players agree on a winning total before starting. (100 is a quick game whilst 300 is a long game).

Player 1 starts the game with control of two dice. He/she rolls the dice and the total of the two faces is added to a running total. To get the running total added to his/her score the player must pass the control of the dice to his/her opponent. If one of the dice shows a one, the control of the dice is passed to the opponent. If both dice show a one the player is "dirtied" and loses all his/her score. When the control is passed over the running total returns to zero.

The first player to exceed the agreed total, after player 2 has completed his/her turn, is the winner.

ZX-81 @ £5.00 incl. P/P. Spectrum 16/48K @ £6.00 incl. P/P

SLIDER

The computer will generate a 5 x 5 square containing the letters A to X. Your task is to re-arrange the letters so that they look like

this	ABCDE	or this	ABCDE
	FGHIJ		FGHIJ
	KLMNO		KLMNO
	PQRST		PQRST
	UVWX		UVXW

The grid contains a single blank square. To move any letter or series of letters, press any letter which is orthagonally in line with the blank square.

ZX-81 @ £5.00 incl. P/P. Spectrum 16/48K @ £6.00 incl. P/P.

BOARDROOM (for the Spectrum 48K or ZX81 16K)

You have been appointed as Managing Director to a major Company based on an island in the Far East. Competition is fierce and you will need both skill and courage to outwit your rivals in times of crisis. Play against the computer in this stimulating game of business intrigue or why not let the family join in? But beware, Boardroom is more than just a game, it's a challenge . . .

Have you got what it takes to survive. How long can you survive strikes, wage demands, low productivity and cash flow problems . . .?

Spectrum version £6.00 incl. P/P. ZX-81 version £5.00 incl. P/P.

OX

A grid of X's and O's will be created forming a playing area. The two opponents take turns to manoeuvre a cursor so that it covers an X and an O. By pressing the 'M' key the chosen X-O pair will be removed. The winner is the last player to remove an X-O pair.

ZX-81 @ £5.00 incl. P/P.

TENFOUR

There are 4 numbers hidden by the computer at different locations on a 10 x 10 grid.

Try to find the 4 numbers in the least number of moves by inputing to the computer a square number of your choice.

The computer will then tell you how far away you are from any of the hidden numbers in the grid.

This is a game for strategists who enjoy working out puzzles. Sounds easy . . . doesn't it?

Also available for the 16-48K Spectrum with sound and colour.

ZX-81 @ £5.00 incl. P/P Spectrum 16/48K @ £6.00 incl. P/P.

Also available on the same tape is **SNATCH**

This is an addictive game using numbers. The idea is to move around the grid collecting numbers from 0 to 9 which are added to your score.

Another strategy game for puzzle lovers. It is easy to make a wrong move and the you are out. How many numbers can you hit before you go over the edge? A choice of 65,535 grids or typing a 0 will give you a random choice location.

ZX-81 @ £5.00 incl. P/P. Spectrum 16/48K @ £6.00 incl. P/P.

MAZERK

Three cylindrical mazes each a bit harder than the last. Move the asterisk through the maze to find the way out. There are ramps in the maze which move the asterisk three places ahead so you may end up missing the exit you wanted to go into. The computer will count the number of moves you make and tell you on completion of the maze, how well you have fared. Being a cylinder maze you can go out of one side and come back in on the other at the same level. Definitely frustration.

ZX-81 @ £5.50 incl. P/P.

LEAGUE CRICKET 48K Spectrum

A chance to play cricket with everything you could possibly need to be realistic. Nothing has been left out which other similar games give you. At the press of a key it is possible to inspect averages, see the league table, save the league table to tape or quit the program.

The pitch will deteriorate as the match goes on. Batsmen "play" themselves in, playing better as they get the "feel" of the play.

Each ground has its own characteristics and this will effect the way the game goes. The West Indies pitch is better for fast bowling etc.

The player chooses which team will play the other teams shown on a chart. The player can then choose who will bowl the over. If your bowlers bowl for too long they will become tired. In an over it is also possible to bowl short balls and the batsman can be injured.

We've left nothing out so that you will get maximum enjoyment from your game.

It's all yours for £7.00 Inc P/P. Coming soon for the 16K ZX-81

SPECIAL NEW OFFER READ ON!

CBM 64

The Latest Colour Computer with 64K Memory and Music Synthesizer

FEATURES

Full Colour, Music Synthesizer, High Resolution Graphics with sprites for 3D effects. Full Size Typewriter Keyboard, Pet Basic.

NEW PRICE: £229.99 inc VAT and FREE CASSETTE DECK

OR

JUST SEND £199.00 + Carriage AND WE WILL PAY THE VAT AND SEND YOU A CBM64

VIC 1541
SINGLE DRIVE FLOPPY £229.00 inc VAT

N.B. Full 12 Months Parts and Labour Warranty
Prices from 1st August 1983
All prices Subject to Manufacturers Price Changes

437 Stoney Stanton Road,
Coventry, CV6 5EA.
West Midlands
Tel: (0203) 661162

IBEK SYSTEMS

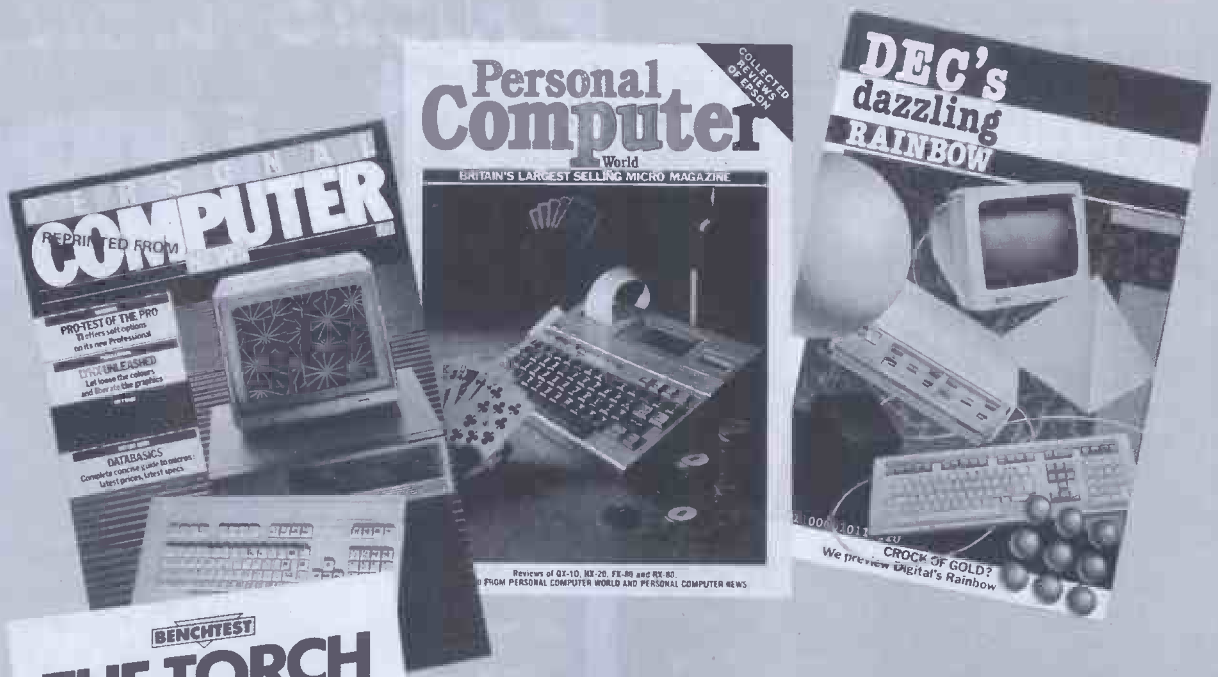
TOTAL	£
+ CARRIAGE	£ 5.00
	£

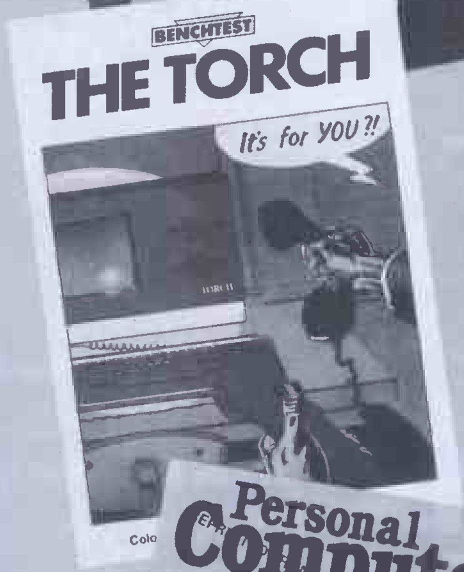
*I enclose Cheque/Postal Order for £

NAME .... ADDRESS .... TEL. NO ....

Signed .... * Please charge my Barclaycard/Access No.

Or telephone order *Delete as required





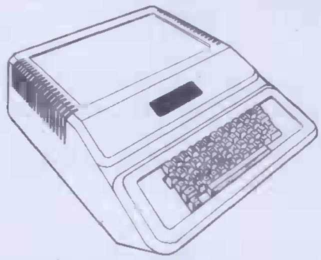
REPRINT SERVICE

If you are interested in a particular article or advertisement in this publication you might like to take advantage of our special Reprint Service. Let our high quality reprints provide an attractive and impressive addition to your portfolio of promotional material

For further details and a quotation, give us a call today

Ring
ROBERT BUGGS
on
01-636 6890
Ext. 259

COMPUTER "X"



The original Apple compatible comes with a 12 month guarantee.
★ Typewriter quality keyboard.
★ 8 expansion ports on rear of circuit board.
★ Unlike other "bandwagon" products, the "X" has full 50Hz colour TV/monitor compatibility for the UK.

Computer "X" has an identical computing performance to the Apple. Both the 64K and 48K "X" are guaranteed to support all software which will run on the Apple II+ and IIE.

48K Computer "X" £295
64K Computer "X" £455
48K "X" + 12" monitor + disc drive with controller and interface £590
Additional Shugart or Alps drives (fully Apple compatible) £180

Our range of expansion cards are both Computer "X" and Apple compatible:

Twin port disc interface	£31	80 column	£44
Language	£33	16K ram	£31
Forth	£38	Z80	£34
Printer interface	£40	RS-232	£33
Integer Basic	£34	PAL (Eurocolour)	£35

256K solid state virtual disk-plugs in just like a card and is equivalent to two normal drives. Access/storage of information is 4 times faster than a normal drive £235
Large SAE for more information .... (prices exc. VAT)
All items available directly, free carriage mainland U.K.

C.I. CAYMAN LTD.
31 Lansdowne House, Water Street, Birmingham 3
Tel: 021-705 7097 for demonstration now
Telex: 337000 JBESOL G

GUILDFORD COMPUTER C·E·N·T·R·E

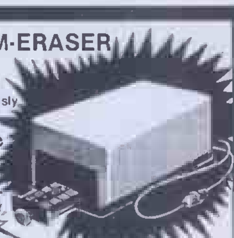
Stockists for:
THE NEW LAMBART DUET 16.
BBC • ORIC • DRAGON • NEWBRAIN • COMMODORE • SPECTRUM • SHARP

PLUS
FULL RANGE OF BUSINESS SYSTEMS INCLUDING
TANDY MODEL 2, 3, 4, 16.
OLIVETTI, SIRIUS, PIXEL

1 THE QUADRANT, BRIDGE STREET, GUILDFORD, SURREY GU1 4SG
TEL: 0483 578848

EPROM-ERASER

erases 4 EPROMS simultaneously



Low price
Only ! £ 26.50

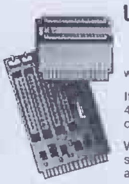
MACH 3

PRINTER BUFFER

Why wait for your printer ?...
With the MACH 3 you can use your computer, while the printer is working.

	16 k	32 k	48 k
par. input - par. output	£ 86	£ 98	£ 109
serial input - par. output	£ 94	£ 109	£ 123

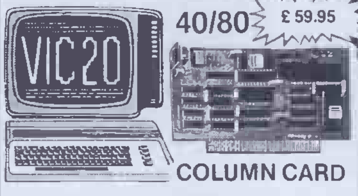
VIC 20 EXPANSION UNITS



with 2 slots £ 15.50
If ordered together with the 40/80 Column card and the 64 k card £ 5.95
With 5 slots, fully buffered, switches for deselecting slots, and on-board power supply £ 29.95

40/80 COLUMN CARD

£ 59.95



Turn your VIC 20 into a professional computer ....
40 or 80 columns instead of 22, very sharp and stable picture.
Try it out without obligation!

VIC 20 64 k RAM + 2 k EPROM EXPANSION

£ 59.95

With software for RAM-files. Easily connected. Needs no extra power supply.

VIC 20 EPROM CARD

£ 11.95

Expand your VIC 20 with two 4 k EPROM sockets.
Addresses are changeable.

for all our products: Dealer inquiries invited.

Universal
EPROM PROGRAMMER
for 2716, 2732, 2516 and 2532.

(Already over 1000 satisfied users) £ 31

- Assembled and tested
- With extended manual (21 pag.)

This programmer can be very easily connected to almost any microcomputer, e.g.:
OSI xP, PET, CBM, TRS 80, EXIDY, SWTPC, EXORCISER, NASCOM, MAXBOARD, AMICOS, ACORN ATOM, VIC 20, APPLE, JUNIOR, SYM, DAI, AIM, EXPLORER, HEATHKIT, ZX 81, ABC and CBM 64.
Convince yourself, that this programmer also can be very easily connected to your computer, ask for a free brochure.

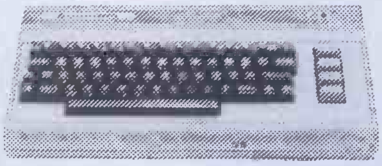
Control software in EPROM £ 6.50

zero ELECTRONICS

- All prices exclude VAT.
- Access and Barclaycard orders welcome.
- We have good documentation of all our products, free of charge.
- All equipment can be tried out without obligation; if returned undamaged within 10 days, you only pay postage and packing costs.

149 KINGSTREET + GT. YARMOUTH NR30 2PA + TEL:(0493) - 2023
(NASH HOUSE)

COMMODORE 64
PRICE SLASHED



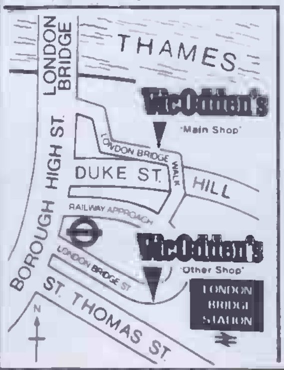
Powerful 64K RAM
40-colour displays to monitor TV. High resolution graphics and 3-dimensional effect capability, music synthesiser. Z80 additional processor option.

NOW ONLY £199.95
add £3 Mail order or Free C.O.D.

1541 Disk Drive for Commodore 64 £229.00

ORIC-1	JUPITER ACE	BBC MODEL B & D.F.S.
£139.95 with software & printer offer!	£47.95	£469.00 OS 1,2 1982 Basic

Plus many other Micro Bargains - Software & Books etc



APPOINTED spectrum DEALER

We are members of the SPECTRUM group of micro dealers - see SPECTRUM's ads in PERSONAL COMPUTER WORLD every month
add £3 Mail order or Free C.O.D.

■ Access, Barclaycard & Spectrum Chargecard welcome ■ Instant Credit - please ask for written details ■ Send S.A.E. for other computer bargains

VicOdden's of London Bridge

6 London Bridge Walk, London SE1
Tel: 01-403 1988

TURN YOUR PROGRAMME UPSIDE DOWN

Now you can add another dimension to your games. Swap direction, swap functions, confuse your friends. In fact you can add almost any twist to your games with Stonechip's Programmable Joystick Interface.

You can also listen to them with Stonechip's Echo Amplifier.

Programmable Joystick Interface. This also enables any Spectrum software to be used with a joystick, irrespective of which keyboard keys have been chosen for function.

Programming is easy using only a single switch. Switch one way to program and another way to play. No tapes to load or links to worry about — all programming is achieved by hardware. Used with Atari-compatible joysticks. Simply plugs into rear expansion port of ZX-Spectrum. No other connections to make, no additional power supply required.

Echo Amplifier. How would you like to listen to the sound output from your ZX-Spectrum without ear strain? The Stonechip Echo amplifier can do this for you as well as easing the tedium of saving or loading of tapes and enlarging the range of tape recorder compatibility with the computer. The amplifier has volume control over a range adequate for most uses, and a tone control for harsh or mellow sounds. A switched interface removes the need to swap leads during 'SAVE'ing or 'LOAD'ing. Leads are left connected all the time and the desired function is selected on the three position switch by the user. Use of the 'CUE' facility enables an audio cue to precede the program being 'SAVE'd on tape, a decided advantage when searching through a multi-program tape. The Echo simply plugs into the Ear, Mic and Power sockets of the computer and does not require an additional power supply. The expansion port at the rear of the computer is left free for use with other peripherals and the unit is housed in an attractive case custom designed to complement the ZX-Spectrum.

To: Stonechip Electronics, Unit 9, The Brook Industrial Estate, Deadbrook Lane, Aldershot, Hants.
Telephone: (0252) 318260.

Please forward me the following products: ....

All prices are inclusive of VAT, Post & Packing for U.K. deliveries (overseas add 15%).

Name ....

Address ....

DEALER ENQUIRIES WELCOME
Delivery approx. 14 days

Access

STONECHIP ELECTRONICS

Stonechip Ltd. Brook Trading Estate Deadbrook Lane Aldershot Hants. GU12 4XB. Tel: (0252) 318260

To all purchasers of Sinclair Small Business Accounts for ZX Spectrum

It has come to our attention that there is an error in some copies of the above program. We are anxious to minimise the inconvenience to purchasers and are therefore taking prompt action to inform you and offer a replacement free of charge.

If you have a copy of this program and it bears the code B6/S on the box spine please store any data on a separate cassette and then return the product with its packaging and user manual **and your name and address** to:

**Sinclair Research Ltd,
Stanhope Road,
Camberley,
Surrey, GU15 3PS.**

We will send you a replacement copy.

KLICK COMPUTER WORKSTATIONS

* Modular furniture in static or mobile form for personal computers
* KLICK units are designed to accommodate a complete range of micros including: Sinclair, BBC, Acorn, Dragon, etc.

* Highly attractive and durable with chocolate brown gloss steel framework and teak laminated shelves
* 4 Basic models with full range of accessories
* Prices start at £47.50

Trade enquiries invited. Further details from:
Store Stock Systems Ltd., 11 Cecil Road, Hale, Altrincham, Cheshire. Tel: 061-928 5388.

INTEGRATED DATA MANAGEMENT

"BMS" for CPM and MPM Micros

★ Word processor and Spread sheet can access User files
★ Graphical data analysis
★ Auto validation on input
★ Screen and Printer templates
★ Page restart for Document printing
★ Advanced file backup/recovery
★ 26 Security levels (if required)
★ Up to 20 user files per "Task"
★ Easy to use High-level Task language
★ Tasks print online or to Spool file
★ 11 date/time options
★ Template or Command operation
★ Data compression and encoding

Price £299

Also "Chess-machine" for ICL PC with excellent graphics and game control features. Includes 900 set problems each with its own time limit. Price **£24.95**

SLOTREE LTD
**4 LEA CROFT, CROWTHORNE
BERKSHIRE
Tel: Crowthorne 773645**

PRINCE MONITOR

A 24 mhz. green screen monitor for LESS THAN £90 – this is the best price ever.

Send £89.69 today for yours.
12 months guarantee.

CROFTON ELECTRONICS LTD.
35 GROSVENOR ROAD, TWICKENHAM, MIDDX 01-891 1923/1513 Telex 295093

Apple IIe
+
DISK II
+
CONTROLLER
+
80 COL. CARD

+

WORDSTAR
+
FULL CPM
+
STARCARD
+
64k RAM

+

GREEN SCREEN MONITOR
+
ALL DOCUMENTATION

=

£1385
+ VAT

DATA BASE

147 All Saints Road Newmarket

Newmarket 667311

EPROM PROGRAMMERS

NEW

BBC — PET — VIC — APPLE — ACORN

Model A 2716, 2516, 2532, 2732, 2732A, 2764, 25128, 27128 .... £110.00
Model B 2716, 2516, 2532 .... £53.50
Model C 2716, 2516, 2732 .... £53.50
PET, VIC, Acorn Model A, B or C All programmers can read/programme/verify/copy
BBC, Apple Model A only
Full software tape supplied for your computer.
PET owners:- Free programme for making your own character sets

PET SUPERBOARD

(40 or 80 column) £52.50

- Select up to 8 ROM/EPROM, RAM/ROMS from programme control.
- No wires, switches or soldering required.
- Will accept any combination of 2k or 4k ROM/EPROMS, RAM/ROMS.
- Select up to 8 of your own character sets.

APPLE VIA BOARD

Single £27.90
Double £36.60

- The VIA board contains 1 or 2 6522 VIA's
- Each 6522 VIAs contains:- two 8 bit programmable I/O ports • One 8 bit shift register.
- Four handshaking lines CA1, CA2, CB1, CB2 • Two programmable timers.
- Full 6522 VIA data sheets supplied.

ACORN MONITOR CHIP (2k)

£10.50

- 10 commands to simplify machine code programming.
- Full screen editor • Repeat key • Auto entry • Flashing cursor • Tape verify
- Slow scroll • Memory fill • and many more.

PET IEEE PRINTER BUFFER

(Available soon)

IEEE-Centronic-R5232
- Free your PET from printing.
- The printer buffer receives all your printer data in seconds (5 sheets). then output your data while you type you next letter.
- 14k printer buffer.
- Full IEEE to IEEE or IEEEto Centronics output.
- IEEE to R5232 optional extra.

S.A.E. for details

CONNECTORS		CHIPS			
PET IEEE user port	£5.65*	2716 EPROM (2k)	£4.00*	C10 cassettes (10)	£5.00*
VIC user port	£5.65*	2532 EPROM (4k)	£6.50*	EPROM ERASER	£40.00*
VIC games port	£5.65*	2764 EPROM (8k)	£8.00*	EPROM eraser timer	£10.00*
Acorn expansion port	£7.00*	6116P-3 static RAM	£4.50*	*All these prices include VAT and P&P	
PET cassette port (crimp)		6522 VIAs	£6.50*		
Orders over 100	£1.00*				

PLEASE ADD 15% VAT PLUS £2.50 P&P TO YOUR ORDER

OFFICIAL ORDERS WELCOME

CID COMPUTER INTERFACE DESIGNS

4 ALBERT ROAD, WEST BROOK, MARGATE, KENT. Tel: (0843) 294648

IS YOUR MIND A BLANK ABOUT MICROS?

KAI

01-328 3968/7038

KOMPUTATION AUTOMATION INFORMATION LTD
203A BELSIZE ROAD, LONDON NW6

MAKES MICROS MAKE SENSE!

apple computer

PROFESSIONAL SALES & SERVICE

WORD PROCESSING SYSTEM – MICROWRITER & PRINTER £999, APPLE STARTER W/P £1999, APPLE PROFESSIONAL W/P £2999.

MYKRONOS SOFTWARE

THE CP/M SPECIALISTS

WORD PROCESSORS—DATA MANAGEMENT SYSTEMS—BUSINESS APPLICATIONS—NUMERICAL MODELLING SYSTEMS—PROGRAMMING LANGUAGE—SOFTWARE DEVELOPMENT AIDS—COMMUNICATIONS SOFTWARE—SORTING PROGRAMMES—HARDWARE/SOFTWARE PUBLICATIONS

Software available in nearly all popular formats
10%–25% discount available on most popular range
The larger your order the higher your discount rate

This coupon entitles PCW readers to an extra 5% discount on all products (excluding Wordstar) for October only

5% Discount Voucher

Name ....

Co. ....

Address ....

Tel No. ....

Mykronos Software, Unit 1c,
Pier Road, North Feltham Trading Estate,
Feltham, Middlesex

SPECIAL OCTOBER OFFER FOR PCW READERS
WORDSTAR ~~£295~~—£210

Why pay more for your software

☎ **01-890 8000**

CALL US NOW FOR INSTANT QUOTATION OR COMPLETE THE COUPON AND SEND IT WITH S.A.E. FOR OUR CATALOGUE

OUTSTANDING PRICES FOR PRINTERS AND APPLE II+ PERIPHERALS

APPLE II + COMPATIBLE DISC DRIVES

HALF HEIGHT DRIVE MODEL LH-1
£167

APPLEMATE DISC DRIVE
£167

All cards fully tested. Money back guarantee.

	MRP	*OUR PRICE*
EPSON		
Epson FX80	£438	£359
Epson RX80	£279	£229
Epson RX80 FT	£319	£269
Epson MX82T/3	£349	£289
Epson MX100/3	£475	£399
Epson FX100	£569	£479
Tractor feed (FX80)	£32	£29
TEC		
TEC F10-40 (Serial or Parallel)	£1,285	£999
TEC F10-55 (Serial or Parallel)	£1,675	£1,299
Tractor feed	£150	£129
Single Sheet Feeder ASF560	£650	£589
TEC DOT MATRIX		
TEC 1550P (Parallel)	£550	£489
TEC 1550BCD (Serial)	£599	£529
STAR		
DP 510	£289	£229
DP 515	£399	£339
HERMES		
612C WPQ	£1,950	£1,499
SHINWA		
CTI CP80	£289	£229
SEIKOSHA		
Seikosha GP100A	£215	£169
Seikosha GP100VC	£215	£169
Seikosha GP250X	£250	£219
Seikosha GP700A (Colour printer)	£425	£369
Friction feed	£25	£22
JUKI		
Daisywheel 6100	£399	£339
RITISHAUSER		
Sheet/Envelope feeder	£457	£399
MONITORS		
Sanyo 12" Green monitor	from	£59

Other makes available

Many other names available, eg OKI microline, Anadex, NEC, Ricoh, Olympia, Smith-Corona, Qume, etc, etc . . .

Note: All prices are excluding VAT & P&P.

Add 15% VAT to all orders. P&P: under £100 add £3, over £100 NO CHARGE. For full details and prices of all computer consumables and printers ring:

021-356 7402 or write to:
ROSCO LTD., Freepost, Birmingham B20 1BR

CLIP YOUR WINCHESTER BACKUP

CLIP — Compressed Library Interchange Program

CP/M MS DOS CP/M-86 £95 RTII £150

- **Backs up a Winchester on to floppies.**
- **Compresses text or data to less than half size.**
- **Large files can span multiple discs.**
- **Selective backup or retrieval, on an inclusive or exchange basis.**

CLIP has no equal in reputation, convenience, power or economy.
CLIP comes standard with the **CIFER** Business Management System, and with all Winchester systems supplied by **COLT** and **RML**

CLIP offers effortless backup.

You can create new commands using a menu procedure, and give each command a name, for later use. To repeat that command, the name alone is sufficient.

With **CLIP's** powers of selection and compression, the user can expect a four-to-one saving over global copying, with no effort except to feed discs on cue.

Or, **CLIP** can select just the new/updated files and reduce the backup load still further.

All prices excl. VAT, post free in U.K.
Most popular disc formats from stock.

KEELE CODES LTD
University of Keele, Keele, Staffordshire, U.K. Tel: (0782) 629221 Telex: 36113
24-hour telephone service: Access accepted

NEWBRAIN SOFTWARE

From the software house of Elstree Computer Centre
A superb range of easy to use programmes
Purpose made and designed for the
fabulous Newbrain Computer

Word Processor Propen 32(4) now with additional facilities	£33.50
Database	£25.50
Invoice and credit note programme	£39.00
Invoice and credit note review	£22.50
Sales Ledger	£34.50
Stock Control	£29.50
Customer Information File	£32.00
Bank and Cash balance	£29.00
Inventory	£29.50
Mailing List	£29.00
Home Expenses	£25.00
Product Costing	£27.75
Sales Analysis	£27.50
Inventory Analysis	£33.50
Business ratios, for Investment, Sales, Turnover etc	£33.50
Calculate for Costing, Bidding (with your mark-up)	£29.50
Mortgage repayments/property investment	£21.50
Address Book	£25.00
Business Expenses	£29.50
Purchase Ledger	£38.75
Product costing	£27.50
Garage bookings	£32.50

VAT @ 15% should be added to each of the above
(include 90p P&P per program)
Phone for your nearest dealer
Send large S.A.E.
for complete range of programs
ELSTREE COMPUTER CENTRE
32 DEACONS HILL ROAD, ELSTREE, HERTS WD6 3HL
Tel: (01) 953-6921
EXPORT AND DEALER ENQUIRIES WELCOME

"NEWLY RELEASED"

NEWBRAIN SOFTWARE

HOTEL BOOKINGS (for 48 weeks)	£35.75
PHARMACEUTICAL LABELLING	£38.75
APPOINTMENTS DIARY	£25.00
STATEMENTS (Print out to customers)	£39.00
PRO CALC (Newbrain financial spreadsheet)	£34.50
P.A.Y.E. full working pgm	£38.50
SURGERY booking system	£39.75

* NEWBRAIN MODEL A *

MODEL A. £190.44

- 80 CHARACTER DISPLAY PER LINE
- 4 CHARACTER SETS
- VERY FAST: ACCURATE KEYBOARD
- IDEAL FOR BUSINESS USE

AD — £216.53/A £190.44
A FULL RANGE OF EPSON & OCI MICROLINE PRINTERS & MONITORS

A FULL RANGE OF PRINTERS AND MONITORS ESPECIALLY FOR THE NEWBRAIN A & AD IN STOCK

OFFICE HOURS 9-6 MON-FRI.

☆ TAPE RECORDER MODIFIED ESPECIALLY FOR THE NEW BRAIN MODEL A AND AD NOW IN STOCK £29.75 + VAT

ACCESS & BARCLAYCARD

DATA DISK

COMPARE OUR PRICES

PRINTERS

"Star" DP5 10 Printer (RRP £289 + VAT) (80 Column 100 CPS) — Our price only £270 incl. VAT Free Delivery. No extras

"Star" DP5 15 Printer (RRP £399 + VAT) (136 Column 100 CPS) — Our price only £375 incl. VAT Free delivery. No extras

The new "Juki" 6100 Daisywheel (RRP £399 + VAT) — Our price only £375 + VAT Free delivery. No extras

Epson FX80 £425 incl. VAT
Epson RX80 FT. Our price £315 incl. VAT
Epson RX80 £285 incl. VAT
OKI Microline 83A £525 incl. VAT
OKI Microline 80A £225 incl. VAT

ALL PRINTERS CARRIAGE FREE

BASF FLOPPY DISK
5¼" Single sided/single density = £15.00 for 10 + VAT
Single sided/double density = £22.00 for 10 + VAT
Double sided/double density = £24.00 for 10 + VAT

8" disks and quad density also available
5¼" plastic library cases £2.75 each + VAT

NEW FROM FRANCE
Library cases in brown/cream
5¼" 20 capacity **£2.80** + VAT
8" 25 capacity **£5.75** + VAT
Lockable disk filing cases with carrying handle, brown/cream, 5¼", 100 capacity, only **£18.50** + VAT

OTHER LOCKABLE CASES
5¼" 40 capacity **£15.95** each + VAT
5¼" 90 capacity **£22.70** each + VAT
8" 40 capacity **£23.60** each + VAT
8" 90 capacity **£32.95** each + VAT

DISK DRIVE CLEANING KITS
5¼" £17.95 + VAT (1 years supply)
8" £17.95 + VAT (1 years supply)
5¼" Basic Maintenance Cleaning Kit **£27.95** + VAT

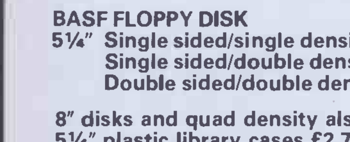
LISTING PAPER
11" x 9½" single part **£9.60** per box of 2000 + VAT
11" x 14½" single part **£12.40** per box of 2000 + VAT
All other sizes available plain or green lined

ADDITIONAL SALES AGENTS URGENTLY REQUIRED FOR VARIOUS AREAS NATIONWIDE

To Data Disk
Please supply ...... Star DP510 Printers @ £270
Please supply ...... Star DP515 Printers @ £375
Please supply ...... Juki 6100 Printers @ £375 + VAT
Or send for our comprehensive price list
Enclosed my cheque/money order total ....
Delivery to: (Name) ______
Address ______
Telephone No. ______

TRADE AND DEALER ENQUIRIES WELCOMED
FOR FURTHER DETAILS CONTACT:
Data Disk (Consumables)
St James Street, Okehampton, Devon. Tel: 0837 4346

JUST ARRIVING THE NEW



MTX 500 £275
MTX 512 £315

MTX 500 computer.
The MTX's 24k ROM has several languages such as MTX Basic Logo and Noddy ROM routines include an assembler/disassembler with screen display of the 280 CPU registers, memory and program which can be manipulated from the keyboard. Pascal is available as an add-on ROM pack. The MTX 500 has 32k of user RAM as standard (64k on 512) expandable to 512k plus 16k of video RAM controlled by a separate video processor. Soon available FDX and HDX systems.

SHARP MZ 711

MZ 711 £240 including VAT

CASSETTE RECORDER £39.95 inc VAT
Four colour Printer £115 inc VAT

The MZ employs a high speed CPU and a large memory of 64k-byte RAM. It has a 510 character set and has two joystick interfaces and a centronics type printer interface. It is expandable to floppy discs plus other add ons for the New Year plus we give £50 worth of software free.

SPECTRUM
48k £125 inc VAT
16k £95 inc VAT

COMMODORE 64
£199 inc VAT

MZ 80A
£375 inc VAT
+ FREE SOFTWARE PACK

TEXAS INSTRUMENTS
£99.95

ATARI 800
£274.95 inc VAT

BBC MODEL B
£399

SHARP PORTABLES
PC 1251 £69.95
PC 1500 £159.95
CE 125 £89.95
CC 150 £169.95

MEMOTECH ZX81 KEYBOARD
£34.95
16k RAM £24.95
32k RAM £34.95
64k RAM £49.95

DEANS
AT EDGWARE RD

283 EDGWARE RD
LONDON W2
723 4630
724 2135

All prices include VAT. We stock a large range of computer books and software. If you wish to order by mail please make cheques payable to Deans and add £3 postage and packing.

SHARP Special Offers

MZ-700

High quality keyboard, Z80 A 3MHz
64K RAM
Full Colour
Cassette Recorder
£39.95 inc VAT
Four colour printer
£115.00 inc VAT

£240 INC VAT

FREE CARRIAGE TO UK MAINLAND

MZ-80A

The MZ-80A comes complete with 48K RAM.
The screen and cassette are built in, instead of expensive extras
+ FREE SOFTWARE PACK

£375 INC VAT

FREE CARRIAGE TO UK MAINLAND

MZ-80B

Complete with 64K RAM
Full electronic cassette mechanism
High resolution dot addressable graphics
40/80 col screen

£750 INC VAT

FREE CARRIAGE TO UK MAINLAND

FULL RANGE OF SOLO SOFTWARE STOCKED FOR THE 700

TOMBS OF KARNAK	GLOBAL WAR
DRAGON CAVES	FIGHTER COMMAND
ENCOUNTER	NIGHTMARE PARK
FLAME QUEST	CHOC-A-BLOCK
ICE WARRIORS	MOUNTAIN RESCUE
TRUCKER	BRICKY
SCOOP	DATABASE FILER
COMMANDO PLAIN	APOCALYPSE

Computer 100 Limited

181 Oxford Road
Reading
Berkshire RG1 7UZ
Tel: (0734) 591616

C.C.S.

SOUTH LONDON AND SURREY DEALERS FOR: APPLE – EPSON – SIRIUS. FOR PRICELESS VALUE IN MICRO SYSTEMS AND CALCULATORS. APPLE IIe £640 – SIRIUS I £1870 - MONITOR INTERFACE FOR EPSON HX20 £135 - APPLE III £1695.

Apple II Plus 48K	£450
Apple IIe Plus 64K	£640
Apple III Plus 128K	£1695
Apple III Plus 256K	£1995
Profile 5Mb Hard disk	£1450
Apple III CP/M card	£230
Disk with controller	£265
Disk without controller	£199
64K Ext. 80 Col. Card	£120
80 Col. Card	£59
IEEE-488 Card	£199
Parallel Printer Card	£89
Super Serial Card	£99
DOT Matrix Printer	£349
Daisy Wheel Printer	£1149

CCS Hard Disks inc. Apple Interface with user definable operating system. DOS 3.3 – CP/M – UCSD Pascal 5Mb – **£1245.** 10Mb – **£1590.** 20Mb – **£1999**

Philips 3500 Multi Station Micro – Multi Tasking – Multi User – Up to 4 Work Stations. Station inc.

VDU & Keyboard	£1200
Master Printer	£1490
5 & 10Mb Processors from	£6000

FILE SHARE VERSION 3 IN STOCK

CP/M 80 & 86 – Turbo DOS – Software

CIS Cobol (Microfocus)	£390
Forms 2 (Microfocus)	£90
Animator (Microfocus)	£190
File Share (Microfocus)	£200

Announcing the C.C.S. Ex-80 Monitor Interface offering Hx20 users 6 display modes (80 × 24 lines) - (64 × 24 lines) - (40 × 24 lines) - (32 × 24 lines) - (32 × 16 lines) - (20 × 4 lines) with inverse video and scrolling features. Graphics. Self diagnostic feature. **£135.**

* Announcing 'Latest releases and prices on Epson printers'

Epson R × 80 100CPS	£279
Epson R × 80FT 100CPS	£319
Epson R × 80FT 160CPS	£438
Epson F × 100FT 160CPS	£569
Epson M × 100FT 100CPS	£475

Epson Q×10 192K RAM plus 2 × 320K disk drives plus High Res Monitor	£1735
Epson Hx20 inc case	£411
Hx20 Cassette Drive	£75
16K Expansion Unit	£80
Bar Code Readers Inc Software	£130
Fross Writer Word Processor	£45
Intext Word Processor	£40
L.Calc Spreadsheet	£15
Sales Order Entry	£20
Card Index	£15
M List Data Base	£15
Correspondent 20	£15
Diary 3 Months	£15

Other products available at competitive rates from CCS include Printers – Interfaces – Diskettes – Software for most machines plus the CCS calculator division. We offer unbeatable value on Casio – Sharp – T.I. – Canon Calculators. Call **'Clare'** for your education or company price list.

Sirius I – 128K + 1.2Mb Disks	£1865
Sirius I – 128K + 2.4 Disks	£2290
Sirius I – 256K + 10Mb Disk	£3395
Additional 128K Ram	£350
Additional 256K Ram	£530
Additional 384K Ram	£715
8087 Maths Processor Board	£530
IBM 3270 Emulator	£350
Async Comms Package	£270
Graphics Tool Kit	£180
IEEE-488 Package	£180
Pulsar Business Software Purchase – Sales – Nominal Data Analysis – Stock – Payroll – Invoicing – all at (each)	£180
Pulsar Informer (Reports)	£256
Pulsar Wordstar	£256
Pulsar Mailmerge	£95
Pulsar D-Base II	£390
Micro Modeller	£530
External 5Mb Hard Disk	£1595
External 10Mb	£1695
Sirius Interface Card	£365
Sirius Network System	POA

TERMS AND CONDITIONS
All prices are exclusive of VAT for delivery add £0-199 + £5.90, £200-1499 + £13.00, £1500 + 1½%. Cheque with order is required or credit is available upon opening an account giving 30 days credit subject to 5% credit charge. Demonstrations by appointment.

*** CCS SPECIAL OFFERS ***

Ex-demo Corvus 10Mb Hard Disk with Mirror – Multiplexer Plus Apple Interface Card. Value New: **£4485** Special **£2990.** Apple II Plus 48K + 16K Card + Colour Card + 12" Monitor + Videx 80 Col. Card + Videx Keyboard – Enhancer + Parallel Printer Card + Master and Slave Disk Drives – All ex-demo. Value New **£1971** Special **£1000.** New Apple Silentype Printer **£135.** Apple A.P.M. (Project Management Package) **£99.** – Mailmerge for Apple **£85.** Wordstar **£180.** Visitrend **£138.** Visischedule **£138.** Apple Data Bases from **£70.** Saturn 128K Board inc. VC80 Software **£269.** Visicalc 3.3 **£105.** Qume Tractor Feed **£90.** Visicalc for CBM **£120.** Microvitec 14" RGB Monitor **£150.** 20" **£200.** HP85 Serial Interface **£199.** TI99/4 Disk Drive **£50.** HP15C **£69.** HP34C **£78.** HPIL Converter Kit **£197.** 41c Printer **£189.** HPIL Cass. Drive **£275.** HPIL Thermal Printer **£247.** Epson MX100 Ribbons **£8.**

C.C.S.
19 PARK STREET
CROYDON CR0 1YD
Tel: 01-686 9616-7-8
Telex: 299944

SPECIAL OFFERS ARE BASED ON CURRENT STOCKS AND MAY BE SUBJECT TO CHANGE

ADVERTISERS INDEX

CHIP CHAT

It's nice to know that standards of common decency are still upheld, even in this harsh commercial world. A proposed advertising campaign by Audiogenic involved the launch of 24 rockets, aimed at the moon. Once there, integral explosive devices would launch a series of soot bombs in a carefully calculated pattern, spelling out the name 'AUDIOGENIC'. But the scheme was vetoed by Audiogenic managing director Martin Maynard. 'The moon', he said, 'shall never be used in such a commercial fashion by Audiogenic. The vision of two young lovers strolling in the country at night and gazing at the moon's surface which has emblazoned on it the name of Audiogenic is something that I will never allow to occur while I am Managing Director. I am prepared to promise that Audiogenic will never use the moon as an advertising medium — provided that my competitors go on record with a similar undertaking' . . .

The recent 'Computer Marathon' for 16-bit machines has provided some interesting evidence of the reliability — or non-reliability — of the contesting machines. It is reported that, of the six machines taking part, only two completed the trial without breaking down — these were the Olivetti M20 and Samurai S-16. All the other competitors, which included the IBM PC, the Wang Professional, the LSI and the Comart, broke down at least once, with the IBM suffering the most stoppages: . .

And now, following hardware, software, firmware *et al*, comes 'foamware' — a truly vital peripheral for all micro users. MicroTie Systems Corporation of Albuquerque, New Mexico has produced the Byte Bat — a 17-inch foam rubber baseball bat which 'gives users a harmless but satisfying way to strike back at computers'. $9.95 gets you the bat, a user manual, a badge, a two-colour poster showing the bat in use and a warning decal that advises 'this computer-friendly livewire is protected by Byte Bat'. The Byte Bat is compatible with all computers and operating systems, which makes it the first universally compatible foamware . . .

A particularly nasty press release reaches us from Oric Products. By now the company will have gathered together and trained a team of two dozen merchandisers who will visit all outlets at least once a fortnight. Oric's sales director Peter Harding says: 'Our team of girls has already been nicknamed the Oric Angels. They will wear an attractive uniform and be trained to cope with the normal day-to-day queries from retailers. The idea of the merchandising team has been warmly welcomed by some of our larger customers such as Laskys and Dixons as well as by the smaller specialist outlets' . . .

Data General has agreed to rename one of its new products, originally titled 'Sphinx'. Apparently a company called Sphinx has been in existence since May, and was set up to market Unix-based products . . .

It has been said that if a dozen monkeys were trained to press the keys of a dozen typewriters — and here we have to assume that the monkeys are immortal and the typewriters never wear out — then eventually they will produce the complete works of Shakespeare, correctly punctuated and with the proper Elizabethan spelling. Along the way, presumably, they would also produce other material — a few Harold Robbins novels, Crossroads scripts, the Oric manual . . . One presumes that the editorial department of *The Micro User* (a magazine devoted to the BBC Computer) has its own roomful of monkeys, writing under the pseydonym of 'Tony Blade'. This would seem to be the only explanation for a very funny piece that appeared in the June issue of *Micro User*, attributed to the said Mr Blade. The article, headed 'Impious thought for the day', was a humorous rewrite of the biblical story of the Flood, the gist of which was that if Noah had been forced to rely on present-day suppliers for his wood, nails, pitch, etc, either the human race would have had to develop gills or else none of us would be here now. All well and good — a bit of humour serves to leaven the sometimes indigestible technical stodge that makes up most micro magazines — except for the fact that the identical piece appeared many years ago in the *Daily Mirror* and came from the prolific pen of Keith Waterhouse, Britain's funniest columnist. All Tony Blade had done was to add a couple of sentences in reference to Acorn Computers and put his name at the bottom. We at *PCW* are not amused by plagiarism — the consensus of opinion is that ripping off from several sources comes under the heading of 'research' and is quite acceptable, but copying somebody else's work word for word is merely theft. Accordingly we wrote to the managing editor of *Micro User* — one Derek Meakin — with the suggestion that the magazine should print an apology and Tony Blade should donate his writer's fee to charity. At the same time a letter was dispatched to Keith Waterhouse, just to check that he was indeed the original author. Mr Waterhouse replied in the affirmative; *Micro User* replied not at all. A phone call to the magazine offices elicited the information that Mr Meakin was busy and could not talk to use, but his secretary said that the matter was being looked into.

Without wishing to get too mealy-mouthed and sanctimonious about this grubby little affair, it should be said that plagiarism is something that all magazines should take very seriously indeed. Leaving aside the moral implications of passing someone else's work off as his own, Tony Blade has left his editor, his publisher and the *Micro User* wide open to an expensive lawsuit. He's very lucky that it was Keith Waterhouse that he stole from — being a forgiving sort of chap, Keith is unlikely to resort to litigation, instead taking the view that 'anyone who would nick someone else's stuff like that has to be so inadequate that seeking redress would be like stamping on an insect'. Other writers might not be so tolerant. Presumably Tony Blade saw the chance to make a quick buck without having to do any work himself. He might well have thought he was safe enough in stealing material that must be about seven years old, but plagiarists are hereby warned — *PCW* spies are everywhere and very little escapes their watchful eye. END

BLUDNERS

Wilder & Co Computer Services' telephone number (Newsprint 'Joining the Gold standard' September) is Woking (04862) 21552 and not Camberley 21552 as printed.

In the notes accompanying MZ-80K 'Directory' ('Programs' September), Surya neglected to mention that the data separator — CHR$(124) — is the bottom right-hand graphics character on the keyboard. This explanation should clear up any problems experienced with the program.

An adventurous reader spotted three bugs in 'Domain of the Djinn' (July Programs). Towards the end of line 945, '... AND EH="E" ...' should read '... AND EH="J" ...'. In line 6000, the fourth RND statement should have 7 as its expression rather than 8. Finally, in line 948 '...(G(U,2)/3...' should read '...(G(U,1)/3...'.

Note: Would Mike Norris, author of Dragon 'World', and K Hussey, author of BBC 'Music Maker', please contact Surya as soon as possible. Thanks.